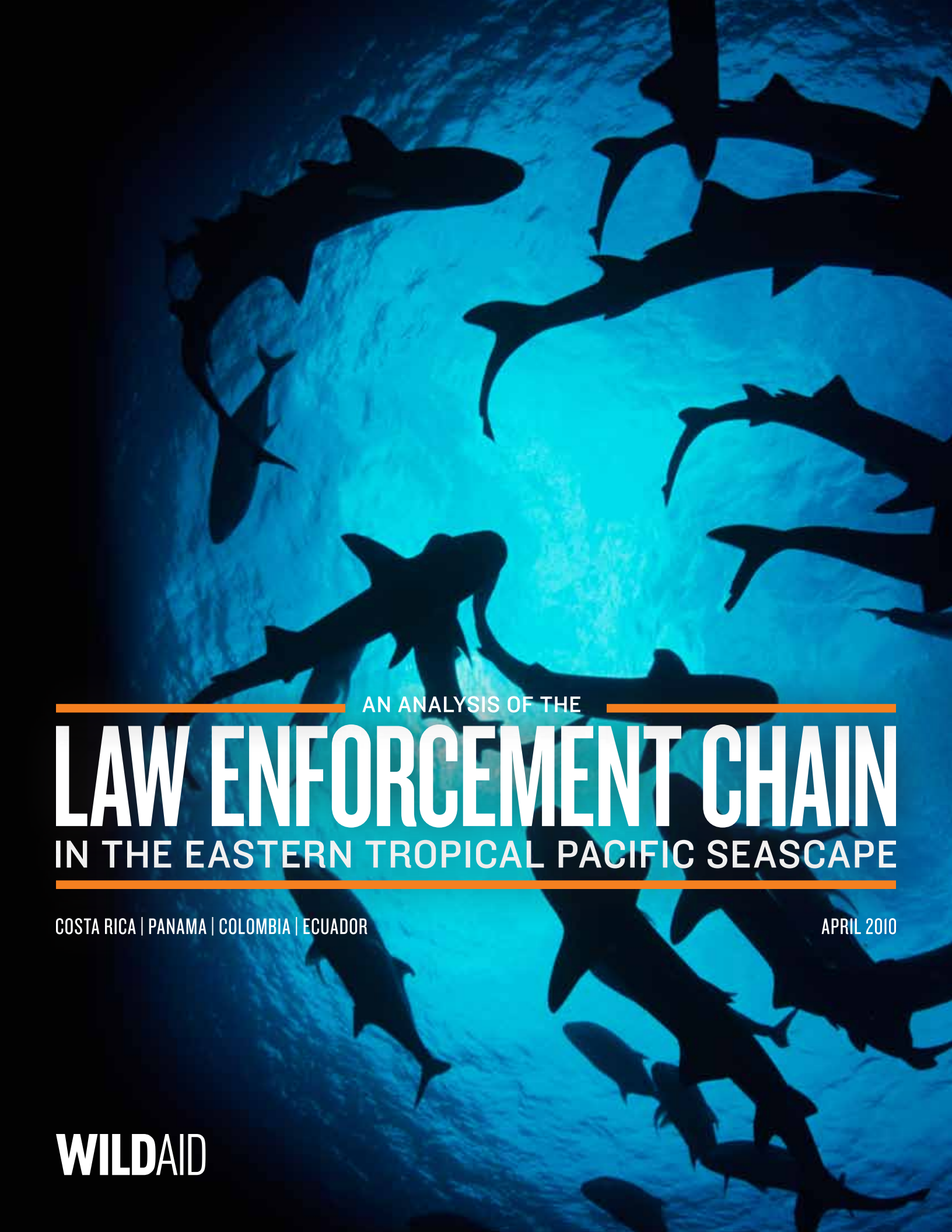

AN ANALYSIS OF THE

LAW ENFORCEMENT CHAIN

IN THE EASTERN TROPICAL PACIFIC SEASCAPE

COSTA RICA | PANAMA | COLOMBIA | ECUADOR

APRIL 2010

WILDAID

An Analysis of the Law Enforcement Chain in the Eastern Tropical Pacific Seascape

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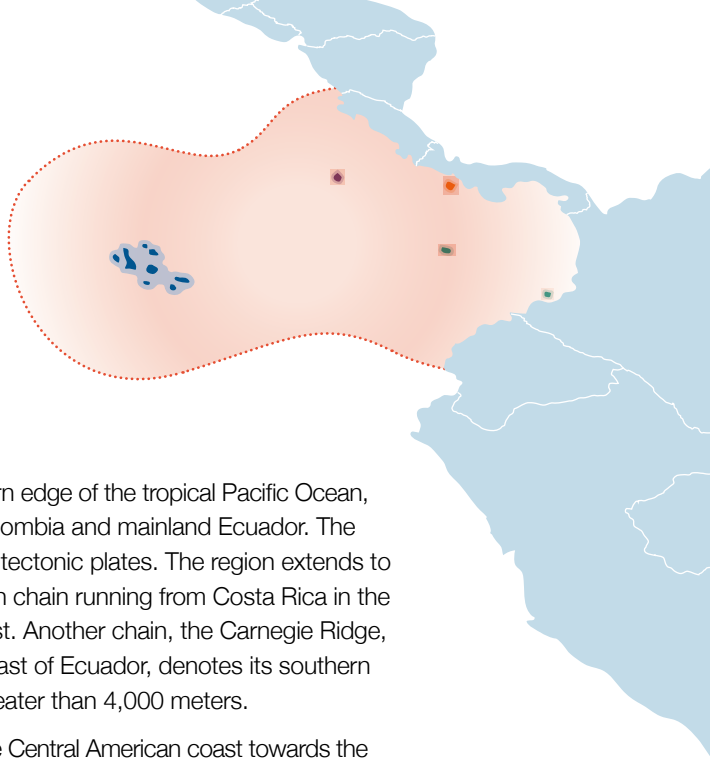
About WildAid

WildAid is an international non-profit organization headquartered in San Francisco, California, with offices in Galapagos, Bejing, New Delhi, London and Toronto. Our mission is to end the illegal wildlife trade in our lifetimes. WildAid's conservation approach is unique and effective. We focus on reducing demand for actively consumed endangered species products through public awareness campaigns in Asia. In addition, we have assisted the Galapagos National Park (GNP) in developing a comprehensive enforcement program to patrol and protect the Galapagos Marine Reserve (GMR) since 1998.



Preface

The Eastern Tropical Pacific Seascape

The Eastern Tropical Pacific Seascape is located at the far eastern edge of the tropical Pacific Ocean, to the south of Costa Rica and Panama, and to the west of Colombia and mainland Ecuador. The Seascape is naturally demarcated by the convergence of three tectonic plates. The region extends to the west as far as the Cocos Ridge, a long submarine mountain chain running from Costa Rica in the north, to the Galapagos Islands over 1,500 km to the southwest. Another chain, the Carnegie Ridge, which runs for 1,000 km, from the Galapagos Islands to the coast of Ecuador, denotes its southern limits. Within these limits lies the Panama Bight, with depths greater than 4,000 meters.

Marine currents in this region are complex, moving water from the Central American coast towards the Eastern Tropical Pacific, where it flows slowly to the west to join the North Equatorial Current. Another current affecting the region is the North Equatorial Countercurrent, which brings surface water to the east. The regional waters are warm (maximum temperatures of 28°C), but in some areas the temperature can drop to 25°C during periods of upwelling.

This Seascape boasts diverse endemic marine and terrestrial species, and displays a high degree of ecological connectivity. It possesses complex ecological relationships due to the dynamic convergence of marine currents that affect the migration and distribution of many species. The islands in the region are home to the most extensive coral reefs in the Eastern Tropical Pacific, and some of these coral species are endemic to the region. The Seascape is a migratory destination for several threatened and endangered species including the blue whale, humpback whale, and the leatherback turtle. Due to its biological productivity, the Eastern Tropical Pacific is of key importance for tuna fisheries (yellowfin, skipjack and bigeye).

The region is vulnerable to degradation as a result of the following human activities:

- Illegal fishing.
- Overexploitation of coastal marine resources.
- Inadequately regulated tourism growth.
- Risk of pollution from commercial vessels (marine transport).
- Habitat loss and degradation.
- Introduction of exotic species.

The region is periodically subjected to extreme climatic events (El Niño – Southern Oscillation), which have negative impacts on resident and migratory species (but sometimes provide new opportunities).

In recognition of its high level of biodiversity, biological productivity and the ecological value of many sites in the Eastern Tropical Pacific Seascape, each one of its four constituent nations has established marine protected areas (MPAs) within their respective waters.

- In 1978, Costa Rice declared Cocos Island a National Park with 24 km^2 of terrestrial area and 1,974 km^2 of marine area.
- In Panama, Coiba National Park, with a terrestrial area of 537 km^2 and a marine area of 2,165 km^2, has existed in its current form since 2004.
- Colombia has two marine protected areas in the Pacific: the Malpelo Flora and Fauna Sanctuary and the Gorgona Natural National Park, designated in 1995 and 1993 respectively. Malpelo includes 3.5 km^2 of terrestrial habitat and 8,572 km^2 of marine area, whereas Gorgona includes 16 km^2 of terrestrial habitat and 598 km^2 of marine area.
- The Galapagos Marine Reserve, which covers an area approximately 133,000 km^2, is the largest marine protected area in the region. The origin of the Galapagos Marine Reserve is the Special Law for the Conservation and Sustainable Development of the Province of Galapagos of 1998. It extends 40 nautical miles from a baseline around the farthest points of the Galapagos Archipelago.

In recognition of their great ecological value, their value as endangered species habitats, and for their natural beauty, four of the five MPAs (with the exception of Gorgona) have been designated as UNESCO World Natural Heritage Sites. UNESCO first recognized Cocos Island National Park in 1997, then the Galapagos Marine Reserve in 2001, Coiba National Park in 2005, and Malpelo Flora and Fauna Sanctuary in 2006. All these islands and their surrounding ocean share certain features – their isolation from the mainland, their endemic species, and their relatively pristine state of protection and conservation.

In 2004, the governments of Costa Rica, Panama, Ecuador and Colombia signed an agreement to create the Eastern Tropical Pacific Marine Corridor (CMAR). The main objective of this agreement is the conservation and sustainable development of the 211 million hectare region which contains the aforementioned MPAs. The CMAR initiative is supported by the United Nations Environment Program (UNEP), UNESCO, Conservation International (CI), the IUCN among others. With over 80 NGOs, research organizations, local community groups, and representatives from the private sector particpating, CI's Eastern Tropical Pacific Seascape (ETPS) initiative has promoted regional cooperation for the training, education and conservation of marine resources.

Study Objectives

The main objective of this study is to identify and evaluate the critical factors required for effective law enforcement in each MPA of the Seascape. The specific objectives are:

1. To determine the main strengths and weaknesses of the law enforcement chain in each MPA.
2. To prioritize a series of recommendations to improve the enforcement chain in each MPA.
3. To identify regional initiatives to strengthen cooperation between member states; in partcular regarding the conservation of migratory species.

Introduction

Six years have passed since the ETPS initiative began supporting enforcement efforts in each of the MPAs. While considerable progress has been made, many Seascape MPA managers identified a number of common factors that continue to limit their effectiveness:

- Insufficient legal framework and/or low implementation.
- Overlapping or interfering jurisdiction between authorities.
- Lack of coordination between authorities.
- Lack of equipment and means.
- Limited economic resources.
- Low technical capacity of staff or insufficient personnel.
- Lack of political will regarding conservation.
- Institutional weakness in the government environmental sector.

Although there are strong commercial fishing links between the four Seascape countries, there is little collaboration on issues relating to environmental management. Vessels from these countries frequently operate illegally in waters belonging to their neighbour states. Recently, tourism vessels from one country have entered the MPAs of another country, which implies that the host nation must address the risk of species introduction, waste disposal management, and to consider the carrying capacities for visitor sites. Currently, legislation regarding these issues is minimal or non-existent. It is clear that not only are there shared weaknesses amongst the MPAs, but that their scarce resources are not being used in the most cost-effective and efficient manner.

In order to strengthen the conservation of the core MPAs, it is essential to determine and evaluate the critical factors affecting law enforcement in each MPA. We developed a comprehensive investigative methodology that highlights the critical factors required for the successful application of law by focusing on the law enforcement chain. This chain encompasses the activities of patrolling, detection of a violation, detention of the violator, prosecution, and the sentencing of violators by judicial bodies or the relevant authority. It also includes an important preliminary stage – the education of users and stakeholders in regulations.

Law Enforcement Chain			
Surveillance and Detection	Interception and Arrest	Prosecution	Sanctions
Personnel	Speed and vessel autonomy	Speed and efficiency of administrative processes	Ratio of cases initiated versus sentences passed
Size and complexity of protected area	Boarding procedures and crime scene investigation	Speed and efficiency of judicial processes	Processing time
Vessels for patrolling and level of autonomy	Collection and management of evidence	Proportion of unresolved cases	Sanctions implemented
Applied technology	Detailed investigation of the crime scene	Ratio of cases submitted versus accepted	
Vessel Availability	Appropriate and timely reporting	Case follow-up	
Distance to settlements and multi-use zones	Correct presentation of documentation to the relevant administrative or judicial authorities	Clear legal framework	
MPA distance to marine traffic	Ratio of detected versus intercepted violations	Correctly prepared reports	
Availibility of information and intelligence			
Planning systematic patrols			
Number of days patrolling per month/year			
Vessels used by violators			
Indicators for Each Phase			
Probability of detection	Probability of arrest	Probability of prosecution	Probability of sanction

Table 1: Components of Law Enforcement

An effective law enforcement system should dissuade potential lawbreakers from committing illegal activities as the consequences/risks associated with apprehension outweigh economic gain. The law enforcement chain requires that each link function in an effective manner and no one link is more important than the other. The chain is only as strong as its weakest link. One can possess a modern fleet that effectively patrols and intercepts vessels illegally fishing in a protected area, but if no effective prosecution or sanction exists, nothing will stop the same vessels from returning. Neither is it useful to have an effective legal system if personnel and vessels are not patrolling and intercepting poachers.

Determination of Vessel Detection Probability in Maritime Areas

In this section we carry out an analysis of the available vessels, number of personnel required, and equipment, which affect the success of patrolling. Although there are several methods to determine detection capacity, we present a quantitative analysis of each MPA which takes into account the size and complexity of the marine area and the number of patrol vessels available, using the following definition (Naval Operations Analysis, Naval Institute Press 2nd Ed. Annapolis Maryland, USA, 1986).

The lower limit (conservative) of detection probability in a random search within an area A is given by:

$$P(det) = 1 - e - \left(\frac{WL}{A}\right)$$

Where:
P(det) = Detection Probability
W = Sweep Width
(Max. effective detection distance, depends on sensor and contact type)
L = Distance covered on search track
A = Area being patrolled

We assume that the fraction of the area covered in each segment (WL/A) is suffiicently small.

The equation is applicable under the following assumptions:

- The position of the contact has a uniform distribution within the area A (it may be found anywhere in the area and there are no signs of the vessel).
- The search is random.

From the formula presented above, we can state that the detection probability improves when:

- **The sweep width** (effective detection distance from boat) **is greater,** this means that we have a sensor able to detect over large distances or that the contact is large (detection might be visual, radar or infrared).
- **The distance covered is greater.** This is achieved by patrolling the area for a longer period of time, which makes autonomy (the period spent at the site) critical. Vessel speed is also critical (the greater the speed, the better – this is why airplanes are ideal for this work).
- **The area is small.** As area covered increases, and the search methods (eg. Binoculars) remain the same, the detection probability will decline.

Interception and Arrest

We examined the patrol vessels available versus those used by poachers to intercept “detected infractions,” or citings within the protected area. It is worth noting that a Park not only requires fast and readily available vessels, but also clear boarding protocols and evidence collection procedures for presentation in a court of law. Anecdotes abound where cases are thrown out of court because Park officials did not follow official procedures resulting in the poacher being set free without fine.

Prosecution

In this section we analyzed the key processes to ensure effective prosecution in each country. Sanctions are usually not administered by National Parks, but by environmental authorities for administrative cases, and the judicial system for penal cases. It is common to encounter contradictory laws as well as regulations and economic interests which thwart the rule of law. We analyzed the regulatory framework and specific cases to evaluate the speed and effectiveness of sanction processes; the goal of which was to provide recommendations to change laws, highlight conflicts of interest that compromise the impartiality of the regulatory authority, and identify low cost alternatives to improve effectiveness.

Sanctions

Finally, we analyzed the relation of cases initated versus those completed to measure the effectiveness of the system. Generally, the statsitics are poor in developing countries and reveal the need for advocacy campaigns to foster dialogue and develop political will for institutional reform.

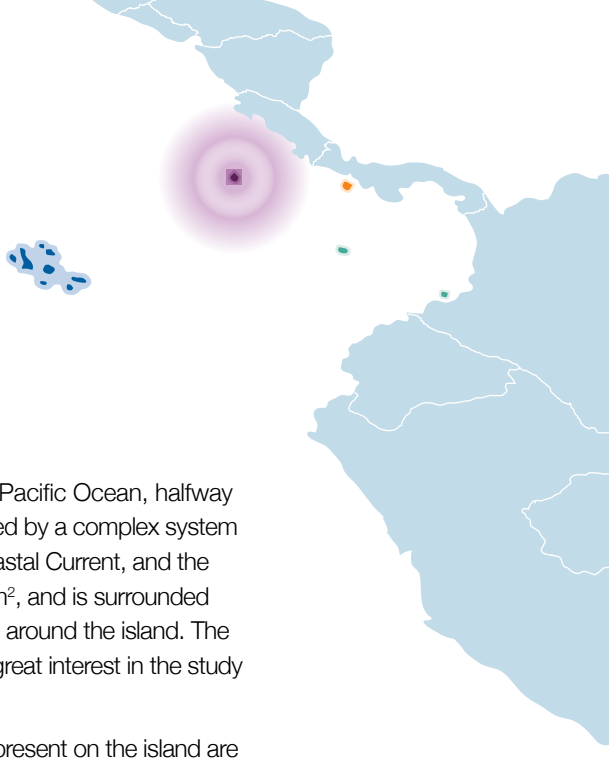
Results

This publication represents the work of a multi-national team. Research methods were developed and applied by a Principal Investigator based in Ecuador with the support of local researchers with expertise in each Seascape country. Although the availability of statistics and the degree of collaboration from authorities varied, we were able to compile sufficient information for analysis. It must be noted that most MPAs in the Seascape were established relatively recently, with the exception of Galapagos. In addition to the law enforcement chain, each country report includes an analysis of the institutional arrangement governing each MPA, existing legal framework and management procedures. We also analyzed the interests of all stakeholders and their relation to their respective MPA. Some MPAs boast innovative governance mechanisms, which affect enforcement and can serve as models for other MPAs. We also report socio-economic statistics regarding the fishing and tourism sectors in order to demonstrate the importance of protected areas for local and national economies. Finally, we identify critical points in the regulatory framework where conflicts of interest and serious weaknesses exist.

We hope this publication will serve as a useful planning tool for both MPA administrators and Ministries, which require a brief analysis, specific recommendations and cost estimations for recommended actions. In addition, the publication may serve as a useful resource for potential donors and non-governmental organizations (NGOs) when defining their investment strategies in cooperation with authorities.

We envisage the impacts of this report to be the following:

1. Prioritization of actions to improve the capacity for arrest and interception.
2. Identification of the main limitations in terms of equipment and personnel (availability, qualifications, training, maintenance, etc.) and actions required to minimize or reverse current situation.
3. Identification of obstacles in prosecution and sentencing of violators, including strategies to strengthen laws and legal processes.
4. Fostering of Improved collaboration between authorities within and between countries.
5. Optimization of limited resources and equipment.
6. Provision of a systematic plan to strengthen each link in the law enforcement chain for each MPA.



Cocos Island
Costa Rica

Description of the Island

Cocos Island is located 532 km to the southwest of Cabo Blanco, in the Pacific Ocean, halfway between the continent and the Galapagos Islands. Cocos Island is influenced by a complex system of marine currents: the North Equatorial Countercurrent, the Costa Rica Coastal Current, and the Costa Rican Thermal Convection Dome. The island covers an area of 24 km^2, and is surrounded by 1,997 km^2 of protected marine habitat for a total circumference of 22 km around the island. The Cocos Ridge emerges from the ocean only at this point, making it a site of great interest in the study of the seafloor and marine volcanic activity.

There are no nearby fishing ports or coastal communities. The only people present on the island are personnel from the Ministry of Environment, Energy and Telecommunications (MINAET), the National Coastguard Service (SNG) and MarViva, along with volunteers and occasional visiting tourists who come to dive. In order to control illegal fishing, the presence of fishing vessels is prohibited within the 12-mile limit, but this regulation is not applied in cases of force majeure or accidental entry.

Socioeconomic Value

Tourism: Cocos Island generates approximately US$6,309,490 for the private sector and between US$441,490 and US$451,290 for the Cocos National Park (PNC) in entry fees (maximum expected values).

Dive Tour Companies at Cocos Island					
Company	No. Passengers	Expeditions/Year	Cost 2008	Gross Annual Income (US Dollar)	Income to PNC (US Dollar)
Undersea Hunter	14	25	$4.495	$1,250,000	$85,750
Sea Hunter	18	25	$4,496	$1,250,000	$110,250
Argos	14/18	10	$4,795	$750,000	$34,300 to $44,100
Okeanos	22	35	$3,735	$2,875,950	$188,650
Pacific Explorer	92	1	$1,995	$183,540	$22,540
TOTAL Gross annual income (approximate)				**$6,309,490**	**$441,490 - $451,290**

Table 2: PNC Income
Note: Entry to the PNC includes anchor rights ($25 to $150 depending on the size of the vessel) and the right of admission per passenger ($25)

Description of the Costa Rican Fishing Fleet

The Costa Rican fishing fleet is a mixed fleet, which ranges from artisanal fiberglass boats to oceanic tuna vessels. These vessels are primarily semi-industrial or are industrial boats with sufficient autonomy and fishing gear to operate around the island.

In Costa Rica, commercial fishing is classified under the following categories described in Article 27 of the Law of Fishing and Agriculture (See Table 3). In this report, we will limit our description to the Pacific coast fleet.

Costa Rica does not possess its own tuna fleet, so it issues annual fishing permits to approximately 24 tuna vessels, which fly flags from Mexico, USA, Panama, Vanuatu and Venezuela. All employ purse seines to capture tuna. The Eastern Tropical Pacific tuna fishery is managed in an integrated regional manner by the Inter-American Tropical Tuna Commission (IATTC).

Criteria	Small Scale	Medium Scale	Advanced Scale	Semi-Industrial	Industrial
No. of vessels	2,588	809	205	40	24
Distance from coast of fishing operations	3 Nautical Miles	40 Nautical Miles	40 Nautical Miles	No limits	No limits
Target species	Grouper, sea bass, bullshark, billfish, hammerheads, tiger sharks	Tuna, dolphinfish, bigeye, sailfish and marlin	Tuna, swordfish and shark as bycatch	Shrimp, sardine and tuna	Tuna
Fishing gear	Hand lines or bottom set lines with J8 hooks, fine mesh nets and trammel nets	Longline	Mechanical gear and longlines	Trawl and purse seine	Purse seine

Tabe 3: Description of the Costa Rican fishing fleet

It is also necessary to consider the influence of the foreign longline fleet, which consists of vessels operating outside the exclusive economic zone (EEZ), but which land their catches at private national docks. These vessels not only operate outside the EEZ, but also enter within its limits, as they know that the coastal nations lack the capacity to control their marine borders. From 2004 to 2008, an average of between 3,000 and 6,000 tonnes of fishery products were landed annually, corresponding to an average of 90 to 140 foreign vessels.

Landings By Fishing Fleet **Costa Rica: 2005, Pacific Fishing Fleet**	
ARTISANAL (small and medium scale)	11,225,737
SEMI-INDUSTRIAL	3,886,261
FOREIGN TUNA	22,000,000
FOREIGN LONGLINE	5,337,186
TOTAL	**42,449,184**

Source: Dept. Fishery Statistics – INCOPESCA; Unit: Kilogram
Table 4: Fishery landings in Costa Rica

According to estimates by the United Nations Food and Agriculture Organization (FAO), in 2002, fishing provided direct employment to 8,567 people and indirect employment to a further 16,500 (Source: 2002 Census Information, National Institute of Statistics and Censuses). Excluding the sports fishing sector, in 2002, fishing generated US$38.9 million; more recent data is not available. In recent years, Costa Rica has also become an important tourist destination for sports fishers. In 2002, this activity generated US$32 million (FAO, 2002). Neither the Costa Rica Institute of Fisheries and Aquaculture (INCOPESCA) nor MINAET record statistics for this activity, as it is mostly carried out as catch-and-release. Important target species include sea bass, wahoo, dolphinfish, snapper, barracuda and tuna.

Analysis of Context/ Governance:

In Costa Rica there is an abundance of environmental legislation dispersed between laws, regulations and decrees. Despite its fragmentation and lack of cohesion, this legislation does contain a series of rules, which cover a wide range of environmental aspects. However, they pose serious complications in terms of responsibilities, timely execution, decentralization for administrative cases, and lack of impartiality in regulatory entities. This report focuses on the legislation pertaining to the protection of the marine resources of the Cocos National Park MPA.

Dissemination of Regulations

Flyers and booklets explaining the fishing regulations have been published and distributed among fishers during workshops and meetings organized by NGOs and authorities. In addition, between 2002 and 2006, members of the Department of Outreach and Training from INCOPESCA carried out 27 workshops in coastal communities to train fishers (men and women) on:

- The new law of Fishing and Aquaculture.
- Basic principles of the FAO Code of Conduct for Responsible Fishing.
- Professional formation of the artisanal fishers.
- The commercialization of fish.

MarViva also carries out annual trainings for attorneys, lawyers and civil servants of the Judicial Investigation Organism (OIJ) and members of SNG and MINAET, except in 2006.

Stakeholders

Public Sector Stakeholders

Name of Institution (Public Entity)	Role in MPA	Role of Civil Servant
Cocos Island Marine Conservation Area	Direct administration	Director Administrator of the National Park
INCOPESCA	Fisheries control	Director of the Judicial Procedures Organ Department of Environmental Control
National Coastguard Service	Fisheries control	Environmental Officer
District Attorney, Punta Arenas	Sentencing of offenders	Attorney

Table 5: Public Sector Actors

Private Stakeholders

Stakeholder	Type of Stakeholder: Public, Private, Community, NGO, other	Type of Attitude or Commitment to the Management of the MPA
MarViva	NGO	Patrol support/ environmental education
Imaging Foundation	NGO	Supporting. Environmental education
FAICO	NGO	Patrol support / environmental education
Pretoma	NGO	Supporting. Research/environmental education
CIMAR	University	Research
UNA	University	Research
Undersea Hunter	Private	Logistics and Patrol support, diving
Okeanos	Private	Logistics and Patrol support, diving
Tuna Fishers	Private	Opposing, Industrial tuna fishing
Longliners	Private	Opposing. Fishery for shark, dolphinfish, tuna, billfish
Sport fishers	Private	Billfish, tuna
OET	Private	Tourism

Table 6: Private Sector Stakeholders

Surveillance and Detection

Ministry of Environment, Energy and Telecommunications (MINAET)

Personnel: 22 employees, 15 of whom work in enforcement.

Average salary: $850 per month/ Administrator: $1,200.

Training: Personnel receive training once a year on average, and recently received training with the Incident Command System. Outstanding personnel have also received training at the National Learning Institute (INA) on marine and nautical issues. Along with the SNG, they have received training on boarding and seizure protocols and procedures. Among the personnel with responsibilities in control and patrolling, biologists and technicians specialized in vessel operation and mechanical maintenance have been hired.

National Coastguard Service (SNG)

Personnel: Five employees are permanently based on Cocos Island, who crew the vessel *Capitán Araya*. The island is visited once a month by 10 more members when they carry out patrolling activities on the vessels *Santa María*, *Pancha Carrasco* and *Juan Mora Fernández*. Each expedition on each of these boats lasts ten days. However, the itinerary is rarely followed and in most years, only about eight trips are undertaken.

Training: Each SNG employee has received an initial five-month training course on the use of firearms, self-defense, survival skills and marine skills. Each year, more specialized training is given to assist in executive promotion, such as navigation, marine legislation, call to action (exercises to practice emergency skills), and drug smuggling detention, which is becoming more and more difficult each year.

MarViva

Personnel: Two staff members are based permanently on Cocos Island who operate the vessel *MarViva I*. Another eight members sporadically visit the island with the patrol vessel *Phoenix*.

Contributions to the Management of the Marine Reserve	
Institution	Amount USD $
National Coastguard Service	$107,000
Cocos Island Marine Conservation Area	$278,737
MarViva	$329,589
TOTAL	**$715,326**

Source: Appraisal of the environmental damage caused by Ariel Bustamante according to case 08-200413-431-PE at the Punta Arenas District Attorney.
Table 7: Contributions to the management of PNC

Detection Probability

The Cocos Island MPA is demarcated by a circumference of 12 nautical miles measured from the center of the island. The area of ocean within this circumference is 603.97 square nautical miles (603.97 Nm^2).

According to the equation defined at the beginning of this publication, detection probability should be estimated with the following site conditions and patrol strategy:

Sweep width: Effective detection distance between 8 and 16 nautical miles (navigation radar X-Band, considering that small or wooden hull vessels must be found) installed on oceanic vessels.

Distance covered: Variable between 120 and 450 nautical miles (under current autonomy, this is equivalent to approximately 12 to 45 hours of navigation)

Area to explore: 603.97 nm^2.

With these parameters, the detection probability is:

Cocos Island MPA

Distance Covered (Nm) or Hours Patrolled Nm/120 \ Maximum Effective Detection Distance (Nm)	62.97%	6	8	10	12	14	16	18	20
120	69.64%	79.60%	86.29%	90.78%	93.81%	95.84%	97.20%	98.12%
150	77.4 7%	86.29%	91.66%	94.92%	96.91%	98.12%	98.86%	99.30%
180	83.27%	90.78%	94.92%	97.20%	98.46%	99.15%	99.53%	99.74%
210	87.58%	93.81%	96.91%	98.46%	99.23%	99.62%	99.81%	99.90%
240	90.78%	95.84%	98.12%	99.15%	99.62%	99.83%	99.92%	99.96%
270	93.16%	97.20%	98.86%	99.53%	99.81%	99.92%	99.97%	99.99%
300	94.92%	98.12%	99.30%	99.74%	99.90%	99.96%	99.99%	100.00%
330	96.23%	98.74%	99.58%	99.86%	99.95%	99.98%	99.99%	100.00%
360	97.20%	99.15%	99.74%	99.92%	99.98%	99.99%	100.00%	100.00%
390	97.92%	99.43%	99.84%	99.96%	99.99%	100.00%	100.00%	100.00%
420	98.46%	99.62%	99.90%	99.98%	99.99%	100.00%	100.00%	100.00%
450	98.86%	99.74%	99.94%	99.99%	100.00%	100.00%	100.00%	100.00%

Table 8: Detection Probability within the Marine Protected Area at Cocos Island

Due to the small area in question, the probability of successful patrolling is very high (we have highlighted all those combinations resulting in a probability greater than 75%). However, patrol vessels require refueling causing them to abandon their station. As we have mentioned earlier, they often have maintenance problems, which prevents their presence on site as well. A well-maintained vessel will normally be available 75 - 80% of the year, so it is necessary to have at least two vessels operating permanently in order to have a permanent patrolling program. It is clear that the Cocos Island MPA has **serious maintenance issues**, and this represents the main obstacle at present.

Due to the remoteness of the area, the vessels must be oceanic. It would be advisable to have at least one small rapid vessel for emergency situations. The crew for each oceanic vessel should consist of six or seven park wardens, whereas the crew of smaller vessels should have three to four park wardens. This implies a total crew of 15-18 park wardens for the entire fleet (allowing for rotational shifts), plus administrative and ground support personnel. Patrolling is not complicated in theory, but due to the logistical and technical factors mentioned above, the current operation is not effective.

As the Cocos Island MPA is relatively small, we recommend the installation of a land-based radar and the use of vessels primarily for interception. This would reduce the recurring costs for fuel and the need for backup crew. As the problem of marine control must necessarily observe the waters surrounding the MPA, this action requires a complementary exercise in sovereignty in the surrounding EEZ, and this does not occur in the case of Costa Rica.

Patrol Vessels and Applied Technology

At present there are four vessels for permanent patrols at Cocos Island, none of which are available 100% of the time. The patrol boat *Cocos Patrol* has continuous mechanical problems, and is operational approximately 50% of the time. *MarViva I* has been in service since 2003 and still functions well. *Capitán Araya* is a new vessel, which arrived in March 2009. However, it had to return to the continent and its service record is intermittent. *FAICO II* arrived to Cocos in March 2009 and to date operates efficiently. MarViva also patrols occasionally on the vessel *Phoenix*, when required to do so by MINAET or SNG.

The onboard equipment is optimal and we suggest the addition of night vision equipment.

Vessels for Patrolling and Applied Technology

	Characteristics			
Vessel	Autonomy	Equipment	Motor Size	Speed
Cocos Patrol	350 MN	SSB Radio, marine band, 2 GPS, 1 12-mile radar, auxiliary motor 36 HP, 1 life raft for 5 p., 1 VMS beacon, 1 EPIRB, video cameras and others.	500 HP	9 Kts
Marviva I	900 MN	Radar FURUNO, incorporated GPS,satellite telephone, SSB radio FURUNO, Radio UHF, video camaras	-.-	8 Kts
FAICO II	180 MN	Radar 12 miles, Radar 32 miles, GPS, SSB radio and marine bandwidth	250 HP	45 Kts
Capitán Araya	n.d.	Radar 12 miles Raytheon, fixed GPS, UHF Radio	-.-	45 Kts
Santa María	1,000 MN	Radar 24 miles, fixed GPS, SSB Radio SSB and marine bandwidth	-.-	14 Kts
Pancha Carrasco	1,000 MN	Radar 24 miles, fixed GPS, SSB Radio and marine bandwidth	-.-	14 Kts
Juan Mora Fernández	1,000 MN	Radar 24 miles, fixed GPS, SSB Radio and marine bandwidth	-.-	14 Kts
Phoenix	1,500 MN	Cellular phone, Radio SSB, marine VHF radio normal and private frequency.	450 HP	-.-

Table 9: Patrol vessels at Cocos Island.

Communication between the Cocos Island administration, the San Jose office, and patrol vessels is limited. For seven months in 2009 not only did the telephone malfunction, but the cellular phone antennas were also damaged. There is Internet service, but only at 128 kbps bandwidth. The HF radio was also broken. There is a single side band radio and marine VHF. In summary, there is internal communication between Wafer Bay and Chatam Bay, but there is no way of communicating with people on the continent. When urgent communication is required, they request support from the *Undersea Hunter* or MarViva.

Organization and Planning for Patrols

There is a Memorandum of Understanding between MINAET, SNG and MarViva to improve patrolling at Cocos Island through the contribution of personnel and equipment from each organization. The Executive Committee, conformed by Commander Carmen Castro Morales (SNG), Walter Gonzalez (MINAET, Cocos Island Conservation Area) and Francisco Estrada (MarViva), meets once a month to coordinate joint operations. In general, patrols are carried out randomly at night or early morning, when fishers are most likely to enter the reserve.

Interception and Arrest

The main results obtained from these joint operations in 2008 (Castro et al., 2008) include:

- 196 patrols were carried out, covering an area of 8,618.2 nautical miles over 1,503 hours. MINAET provided the greatest manpower with 3,810 man-hours, followed by MarViva with 3,680 and finally SNG with 719.
- The greatest abundance of longline vessels, an average of 75.4 per month, was observed between May and November 2008 (an "observation" refers to vessels which were seen either in the protected waters but escaped before being intercepted, or were found at the borders of the MPA). 37 findings were made, resulting in 104.5 miles of longline ("finding" refers to fishing gear found within the MPA limits without an apparent perpetrator). The greatest number of lines was found between March and September.
- The most abundant species found on the longlines were yellowfin tuna (124 individuals) and sharks (81 individuals).

Between 2005 and 2007, approximately 300 joint patrols were carried out per year. In 2008 there were only 196 patrols, a reduction of 30%.

The number of vessels sighted per year has also declined (Figure 2). The greatest number of sightings corresponds to 2005, the year that the Fishing Law was passed. The lowest number of sightings occurred in 2008, although this does not indicate a reduction in the number of vessels operating illegally in the area, but **rather a reduction in the number of patrols.**

The number of seizures, defined as the act when the State takes possession of fishing gear used illegally in the MPA in the presence of those responsible for that gear, has also reduced significantly, from 18 in 2005 to only one in 2008 and none at all in 2007 (Figure 3).

This analysis shows that illegal fishing pressure around Cocos Island is constant and has not been dissuaded by the joint operations. This is clear from the number of vessels sighted and the gear findings, which have both remained constant over time. The significant reduction in cases where gear has been seized – almost zero in the last two years, is a simple reflection of the fact that violators are able to escape.

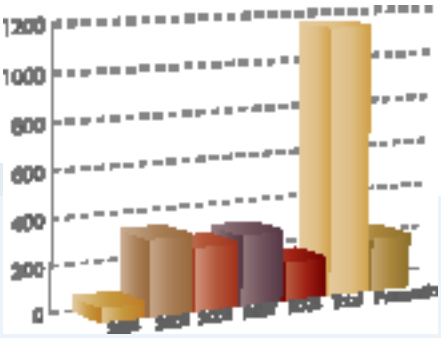


Figure 1: Number of patrols per year, Cocos Island, 2008 (Castro et al, 2008).

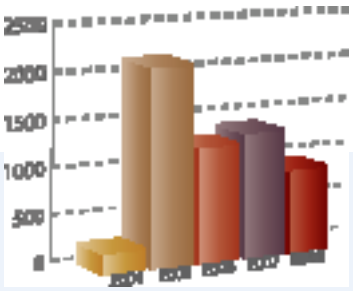


Figure 2: Number of vessels observed per year, Cocos Island, 2008 (Castro et al, 2008).

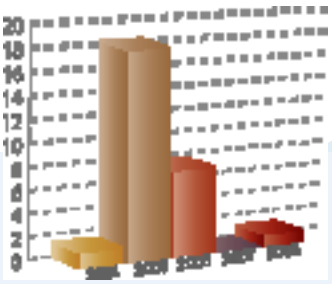


Figure 3: Annual seizures of fishing gear and vessels, Cocos Island, (Castro et al, 2008).

According to interviews with SNG and MINAET officials, this situation occurs because illegal fishers enter the MPA and set short lines of less than 100 hooks. When a patrol boat approaches they have time to escape, because the patrol boats working around the island in 2008 were slow in comparison (*MarViva I* and *Cocos Patrol*). Fishers are willing to run the risk of capture and even the loss of fishing gear, so much so, that when they enter the MPA they use plastic bottles and other low value items as buoys, which they paint blue to camouflage them. At present, there are two rapid patrol vessels at the island, which have the capacity of intercepting illegal fishers (*Capitan Araya* and *FAICO II*). It is hoped that in the near future, as these vessels are used more, a larger number of vessels operating illegally in the MPA will be caught red-handed. Despite this game of cat and mouse, national fishers do tend to collaborate and inform the island authorities when purse seine tuna vessels are present around the island.

Use of Remote Monitoring Systems for Vessels

In Costa Rica there is still no legislation enforcing the use of remote control devices on national and foreign vessels. This would be an excellent tool for monitoring the activities of these boats, not only for issues relating to fishing, but also for reasons of national security. On January 7, 2009, INCOPESCA announced that the national fleet would be subjected to this type of control, which would be implemented and in force as soon as the INCOPESCA executive board emits an official decree. There is still no agreement, and in any case the official announcement did not include monitoring the foreign fleet, which is a major weakness.

Prosecutions, Sanctions, and Sentencing

There is a "Protocol of Actions to take in the Case of Illegal Harvesting of Marine and Coastal Resources (inside and outside of MPAs)" which is, for the most part, respected. This protocol lays out the responsibilities of each institution (MINAET, INCOPESCA, SNG) in the case of an illegal fishing operation. There is also an annually reviewed Memorandum between the Coastguard, MINAET, and MarViva regarding the operations at Cocos Island. However, it is important to mention that INCOPESCA is an autonomous agency. Created in 1995, under Executive Board Law No. 7384, INCOPESCA is an autonomous agency with its own legal status and assets. INCOPESCA is presided over by an Executive President who is designated directly by the President of the Republic. The maximum authority of the institution is the Board of Directors, which is presided over by the Executive President. The Board of Directors is made up of nine members, three of whom are members of government and six of whom belong to the national fishing sector, and include representatives of the tuna cannery, longline fishery, and shrimp trawlers.

According to the Comptroller of the Republic, Lcda. Rocía Aguilar Montoya, in declarations to the Special Permanent Commission for the Environment of the Legislative Assembly on February, 28 2008, in reference to the Comptroller's Report of February, 28 2008 titled: Report on the Evaluation of the Management of the Costa Rican Institute of Fisheries and Aquaculture in Relation to Patrolling and Control of Shark Fishing (DFOE-PGA-86/2006):

> Our report does not really address the issue of executive boards, rather I did perhaps question whether it was appropriate that the Board Members authorize/define the tariffs for their own industry. I think it is more a matter of prevention of conflict of interest, and if at any point a reform is proposed it would be worth at least discussing this issue. Based on this history and what we have seen, at the end of the day what we have is an entity that is exercising power, or guardianship over its own sector, which if allowed to self-regulate itself, will face difficulties in reaching the best situation.

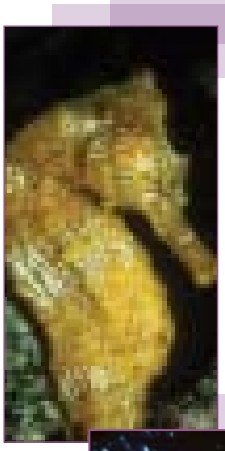
It is precisely this conflict of interest that the Comptroller states is causing the lack of political will for the application of INCOPESCA sanctions -- even when violators are caught by the MINAET and SNG authorities. According to the Fisheries Law, it is INCOPESCA that must establish administrative sanctions. Now, MINAET and SNG go directly to the Office of the Attorney when the Fisheries Law is violated. These penal processes take much longer than an administrative process. Regardless, the INCOPESCA sanctions never materialize given their conflict of interest. Compounding this issue further is the lack of a legal framework which punishes violators severely enough to serve as a deterrent.

In 1996, the articles that laid out the sanctions in the Fisheries Law of 1948 were declared unconstitutional by the Supreme Court. The Court also clarified that as INCOPESCA is an autonomous agency that does not strictly belong to the Government, their inspectors and personnel do not have the same authority as the police (whereas coastguards and MINAET workers do have the same authority as the police). Due to this situation, there was no way to penalize illegal fishing in Costa Rica other than through the Penal Code, which establishes prison sentences of 3 to 15 years for piracy.

Between 2000 and 2005, 60 to 70 cases of piracy were brought to the Puntarenas courts (there is no database with exact numbers, but this is an estimate from the MarViva Association). The Fisheries Law was passed in March 2005. Article 9 expressly forbids commercial and sports fishing activities in national parks, natural monuments and biological reserves. It does, however, permit the accidental presence or entry due to force majeure of vessels in MPAs. Article 153 places a fine of twenty to sixty minimum wages (14,000,000.00 Colones = US$22,000.00) and the suspension of the license in question, for anyone who authorizes or exercises commercial or sports fishing. The passing of the Fisheries Law created confusion among the authorities because no one was sure which law to apply in the case of illegal fishing within the Cocos Island MPA. Should it be charged as piracy via the Penal Code, which implied a prison sentence, or as illegal fishing via the Fisheries Law, which implied administrative sanctions?

According to the Court III of the Supreme Court of Justice (SCJ) (Sentence N°: 379-2008), the Penal Code is only applied for unauthorized exploitation of fisheries resources without a fishing license. If the violator has a license, then the Fisheries Law must be applied, according to Sentence N°: 379-2008 from Court III of the SCJ (and therefore, only administrative sanctions may be applied). At the same time, the Court of Criminal Appeals of San Ramon (Sentence N° 662-2007) states that the Penal Code only applies to fish resources, whereas the Fisheries Law is broader and applies to commercial fishing. The Court of Criminal Appeals further ordered that all open cases of piracy that had not advanced in one year be dismissed due to the statute of limitations. This caused most of the piracy cases, some 50 to 70, to be dropped. Some cases were also dropped because the violators were caught with lobsters, and the Penal Code only applies to “fish” resources.

In conclusion, only seven cases of piracy remained, three of which have concluded, and four of which are still pending. All three of the former cases resulted in prison sentences of three years, one of which was suspended with a fine. The four ongoing cases began in 2001 and 2002. After the passing of the Fisheries Law, five more illegal fishing and three shark finning cases have been opened. Of the former, only one has gone to court, three are with the District Attorney and the status of the remaining case is unknown. None of the shark finning cases have advanced even as far as the District Attorney.

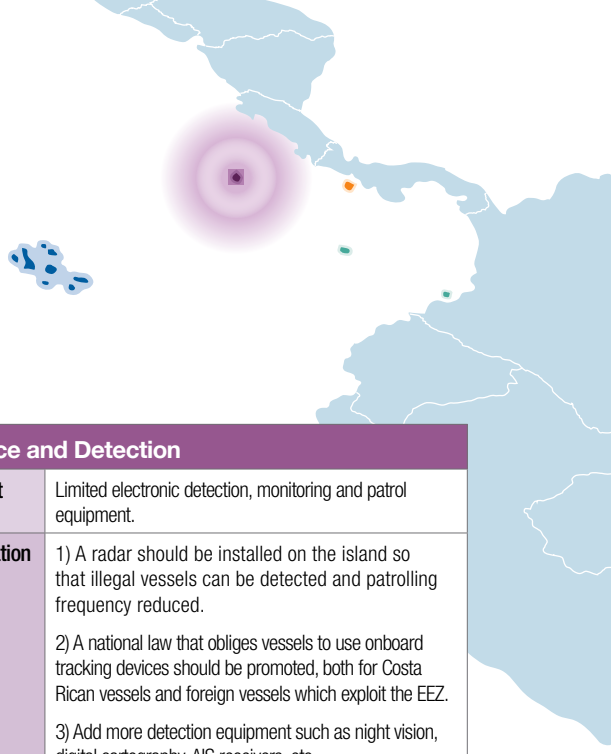


Case Studies of Piracy (Penal Code)

- The vessel *Rita Victoria* was captured on June 25th, 2005 for piracy, and on March 10th 2007, the Criminal Court of Puntarenas passed a guilty verdict on the Captain, sentencing him to a suspended sentence which included a fine of 1,000,0000 colones (US$2,000) over a two year period. The deadline expired on October 3rd, 2009. The process took two years and four months.
- Oscar Serrano Barrio, Captain of the vessel *Capitán Julián*, was found guilty of piracy on February 12th, 2004, and sentenced to three years in prison, which was suspended and reduced to three years probation. The defense appealed, but lost the appeal on September 20th, 2004.
- The vessel *Miss Stacy* was captured while engaging in illegal activities on May 29th, 2002. On May 10th, 2007, the Criminal Court at Puntarenas ruled in favor of the defendant, Captain Leyvin González Fernández, as the crime was redefined as a violation under the new Fisheries Law. The Ministry of Public Affairs appealed, arguing that when the crime was committed, only the Penal Code existed, and therefore it should be judged as such. The appeal was accepted on December 5th, 2007 and the accused was charged with piracy. This case is still pending after five years and two months.

Case Studies for Illegal Fishing and Shark Finning (Fisheries Law)

- The Panama vessel *Tiuna* was caught while illegally fishing with seven tonnes of yellowfin tuna in its nets on January 29th, 2008. Two charges were made: one with the Environmental Administrative Tribunal (TAA) and another with the Ministry of Public Affairs (Puntarenas Courts). On September 22nd, 2009, the TAA (Resolution 843-08-TAA) imposed a fine of US$668,427.81 for environmental damages, and ordered the Executive President of INCOPESCA to revoke its fishing license. On January 31st, 2008, Ariel Bustamante (Captain of the vessel) was tried for criminal offences at the Criminal Court of Puntarenas. On December 17th, 2008, he went to trial at Puntarenas, accused of violating article 153 of the Fisheries Law, which implies a sanction of 20 to 60 minimum wages and the cancellation of the license. The trial is ongoing.
- Between 2008 and 2009, three vessels (*Kendy, Rey de Reyes, Franju III*) were caught in the Cocos Island MPA with shark fins minus their respective carcasses. The violators were absolved in all three cases because Articles 40 and 139 of the Fisheries Law references only the landing of shark fins without their respective bodies, but makes no reference to the transport of removed fins.



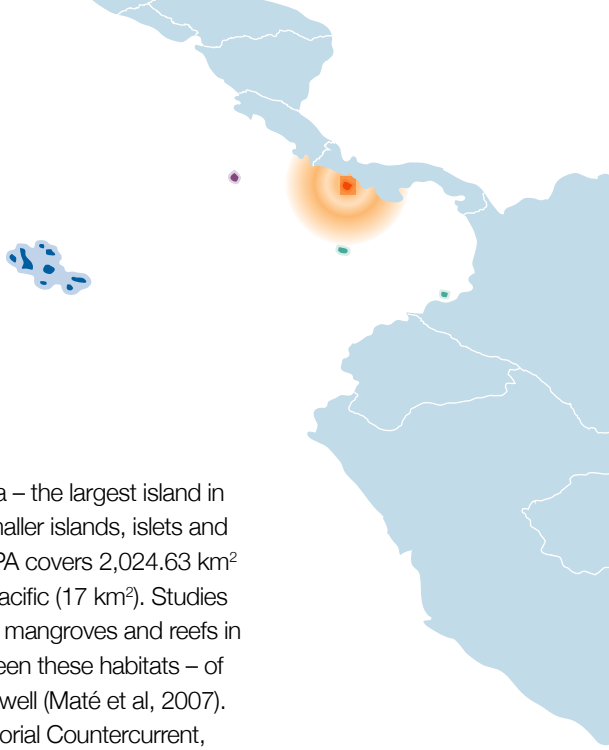
Recommendations
Cocos Island, Costa Rica

Surveillance and Detection	
Critical Aspect	Severely restricted budget.
Recommendation	Change the Law of National Parks and allow greater decentralization, subcontracting, self management or privatization of services in National Parks.
Feasibility	No political will. The proposal has been presented before, but has not received public support. New options need to be considered.
Estimated Cost	US$40,000 for lobbying and technical and legal research of a possible solution.
Critical Aspect	Lack of personnel.
Recommendation	Between 5 and 7 more Park Wardens are required to cover crew, minor maintenance, and land based operations control.
Feasibility	1) Not feasible unless the distribution of income to the PNC is reformed as all funds currently go to a centralized state account. 2) Medium feasibility if external funding from a donor or NGO is obtained.
Estimated Cost	US$48,000 – US$67,000 per year.
Critical Aspect	Park Warden salaries are not competitive.
Recommendation	1) Increase budget for Park Wardens, or; 2) Charge extra fees for tourism and use these funds for salaries.
Feasibility	1) No political will and no funds. 2) The MPA should be allocated part of the funds it generates in order to create an additional per diem payment for field operations.
Estimated Cost	US$25,000 for lobbying costs.
Critical Aspect	Lack of support from national fishing sector. Clear intention to evade patrols.
Recommendation	1) Extend the MPA area to 20 miles. 2) Minimize by-catch by regulating fishing gear.
Feasibility	Medium. MINAET is currently organizing a workshop to consult different sectors on the creation of a new MPA in the area related to the Cocos Island National Park.
Estimated Cost	1) US$50,000 to extend the MPA. 2) US$150,000 to make changes to fishing gear.

Surveillance and Detection	
Critical Aspect	Limited electronic detection, monitoring and patrol equipment.
Recommendation	1) A radar should be installed on the island so that illegal vessels can be detected and patrolling frequency reduced. 2) A national law that obliges vessels to use onboard tracking devices should be promoted, both for Costa Rican vessels and foreign vessels which exploit the EEZ. 3) Add more detection equipment such as night vision, digital cartography, AIS receivers, etc.
Feasibility	1) High. There is interest. 2) Medium. The Maritime Authority should be promoting the regulations based on the IMO recommendations. 3) High.
Estimated Cost	1) US$75,000 including installation and compatible power supply. 2) US$50,000 technical and legal assistance. 3) US$40,000.
Critical Aspect	Poor communication between the installations on Cocos Island and the continent.
Recommendation	Provide communications equipment (radio, broadband internet) and repair existing equipment.
Feasibility	There is interest and willpower.
Estimated Cost	US$50,000.
Critical Aspect	Lack of boat maintenance.
Recommendation	Subcontract or find external technical assistance for boat maintenance via a fund that would cover costs for mechanics, tools and critical spare parts.
Feasibility	High. The MINAET-SNG-MarViva Commission acknowledges the maintenance problem.
Estimated Cost	US $50,000 - $60,000 per year.
Critical Aspect	Tuna vessels flying international flags and national boats constantly enter the MPA (and the Costa Rican EEZ without control or authorization).
Recommendation	Implement obligatory monitoring via AIS satellite control to improve control over the entire EEZ and Cocos Island MPA, and declare the Cocos MPA an IMO Particularly Sensitive Sea Area (PSSA), which would provide MINAET and SNG with a broader scope of action.
Feasibility	Medium. There has already been a pronouncement by INCOPESCA that this system will be implemented for national vessels, but the foreign fleet should also be included.
Estimated Cost	VMS system: $300,000. Includes costs of equipment and technical-legal assistance.

Interception and Arrest	
Critical Aspect	Lack of available speed boats that can intercept violators.
Recommendation	Implement a system of maintenance and spare parts logistics.
Feasibility	Medium.
Estimated Cost	US $50,000 - $60,000 per year.
Critical Aspect	Poor inspection upon boarding.
Recommendation	Training in onboard procedures and crime scene investigation, as well as incident report preparation.
Feasibility	High.
Estimated Cost	US$20,000.
Critical Aspect	Obvious conflict of interest in the INCOPESCA Board of Directors.
Recommendation	1) Move INCOPESCA to the Ministry of Agriculture or elevate it to ministerial status. It must respond to the President of the Republic and must lose its autonomy and the authority of the Board of Directors. 2) Media campaign and legal action in high profile cases.
Feasibility	Low. Not politically viable. Although the problem is acknowledged by several sectors, there is no political will to change the situation.
Estimated Cost	US$100,000. This should be done by an NGO, which would look for support from government agencies (MINAET, SNG) and other state authorities (Parliament).
Critical Aspect	Lack of training for attorneys, Attorneys change constantly.
Recommendation	Permanent training of Puntarenas attorneys at least once a year.
Feasibility	Politically viable. MINAET, SNG and MARVIVA are already working on this.
Estimated Cost	US $30,000 per year.
Critical Aspect	No sanctions for vessels which arrive at the island even though their permits do not allow them to go further than 40 miles from the continent.
Recommendation	1) Include sanctions for violations of permitted vessel autonomy in the new Maritime Navigation and Safety Law. 2) Lobby for the MPA to be declared an IMO Particularly Sensitive Sea Area. 3) Provide the MPA Administration with the power to initiate legal proceedings ex-officio.
Feasibility	1) A Navigation Law is currently being drafted. According to Carmen Castro (SNG), sanctions for violations are being included. 2) SNG and MINAET can present a request to the IMO. 3) Low.
Estimated Cost	1) Political will is required, no economic cost. SNG, MINAET, MarViva are actively working on this. 2) No cost. 3) US$10,000 for legal advice.

Prosecution (cont.)	
Critical Aspect	Shark finning control only states that sharks must be landed with the fins attached, but does not mention transport of fins; neither does it specifically prohibit finning.
Recommendation	1) Include the prohibition of transport of shark fins in the Fisheries Law regulations. 2) Use universities to establish a control and monitoring mechanism at landing sites.
Feasibility	1) Low. More interested parties need to be grouped together for a bigger political clout. 2) Low.
Estimated Cost	1) US$20,000 for an NGO to lobby. 2) US$30,000.
Critical Aspect	Impunity: slow processes and loss of cases.
Recommendation	Provide a lawyer for PNC to work on cases of infringements and violations.
Feasibility	High. Interest exists.
Estimated Cost	US$70,000 for two years.
Critical Aspect	MINAET not authorised to sanction.
Recommendation	We recommend that SNG be empowered to give administrative fines and/or vessel retention for up to 30 days (act as an examining magistrate).
Feasibility	Low.
Estimated Cost	US$85,000 for legal analysis and lobbying.



Coiba National Park
Panama

Description of the Island

Lying in the Gulf of Chiriquí, Coiba National Park (PNC) is made up of Coiba – the largest island in the Central-American Pacific with a surface area of 503.14 km^2, and 38 smaller islands, islets and exposed rocks, which collectively cover a total area of 537.32 km^2. The MPA covers 2,024.63 km^2 and includes one of the most extensive coral reef systems in the Eastern Pacific (17 km^2). Studies have found a total of 800 species grouped in 123 families. The proximity of mangroves and reefs in certain areas creates conditions for the movement of marine species between these habitats – of 117 species identified on the reefs, 45 are common to mangrove areas as well (Maté et al, 2007). The main current affecting PNC and its area of influence is the North-equatorial Countercurrent, which is at its strongest between May and December, when the Intertropical Convergence Zone is at its northernmost position (10-20°N), and is weaker from February to April, when the convergence zone is further to the south.

Zone	Area (km^2)	Percentage (%)
Marine Reserve Zone	476.52	23.54
Resource Management Zone	1,428.01	70.53
Fishing Sub-zone	108.28	5.35
Transit Area	11.82	0.58
TOTAL	**2,024.63**	**100**

Table 10: Zoning of PNC Marine Area

The "marine reserve zone" is the area of the park where all extraction of natural or historical-cultural resources is prohibited; and where only controlled human presence is permitted for activities such as patrolling, research, ecotourism and environmental education. This zone extends from the coastal fringe around the islands, islets and rocks within PNC outwards to sea for 1.8 km (one nautical mile), and encompasses an area of 476.52 km^2. The "resource management zone" corresponds to the area which contains fisheries resources that may be sustainably harvested by artisanal or sports fishers. This includes activities such as sports diving, marine mammal watching, and research. These are permitted so long as they follow the management objectives of the protected area and are geared towards improving the quality of life of the inhabitants in the area of influence of the park.

Although there are 44 fishing communities in the PNC buffer zone, only six have been identified as main users. Operationally, the National Environment Authority (ANAM) manages the PNC in accordance with Law N° 44, 2004. It is therefore its responsibility to control and patrol the 537 km^2 of land area and 2,024 km^2 of ocean. There is an area of 1,600 km^2 to the west, adjacent to the PNC, which has been classified as a Special Marine Protected Zone (ZEPM). Both sites were declared World Natural Heritage Sites by UNESCO in 2005.

Socioeconomic Value

Tourism: Tourism activities are classified in three main categories: nature tourism, sports fishing and cruise tourism. As a result, tourism management by the Park administration should also be specialized for each category in order to satisfy their respective needs. Tourists are currently only classified by nationality (foreign or national) and age (adult, student, or pensioner).

Sports Fishing: This is one of the recreational activities that generates the most number of visits to the PNC, but functions exclusively in the surrounding oceanic waters and within the ZEPM at Montuosa Island and Hannibal Banks, where large numbers of record-breaking billfish have been caught. However, it is worth mentioning that it was not possible to find a single record of sports fishing landings, so the impact of this activity on the marine environment cannot be determined. The main sports fishing operators in the Gulf of Chiriquí are Pesca Panama and Coral Star.

Diving: There are nine land-based sports diving operators that visit the PNC. Six are based in Panama City, one in David (Chiriquí), another in Santa Catalina (Veraguas) and the last operator is a dive boat. On average, the trip expenditure for tour operators is US$661.00, which includes the pay for the captain, crew, fuel, ice, food, drinks and launch permit.

Interesting facts about tourism in PNC

- Provides direct employment to 50 people (tour operators).
- Accomodation prices are currently US$ 15 below the willingness to pay for nature tourists and sports fishers. In 2007, income for this was US$29,957.
- PNC entry fees are US$9 below willingness to pay values for nature tourists; US$12 below willingness to pay values for cruise tourists and US$15 below willingness to pay values for sports fishers.

Source: Montenegro, 2007.

Interesting facts about fisheries in Coiba

- Directly employs 275 people.
- Average monthly income is US$266 per person.
- Gross income in 2007 for the activity was US$ 7.4 million.
- Monthly income for fishing families in the area is US$331, whereas the average family income for the study area was US$149

Source: Montenegro, 2007.

Year	Visitor Type		TOTAL
	National	Foreign	
2003	503	2,372	2,875
2004	1106	4,635	5,741
2005	706	5,936	6,642
2006	829	5,008	5,837
2007	1,484	4,582	6,066
2008	1,687	2,253	8,827
2009 (hasta agosto)	797	2,904	3,701

Table 11: Visitors to PNC
Source: ANAM

Description of the Panama Fishing Fleet

There is a commercial fishery operating in the PNC that targets mainly groupers, snappers and dolphinfish. There is also a sports fishery for both benthic and pelagic species. Artisanal fishing has been highlighted as an important source of income for several communities, with up to 30% of their inhabitants depending directly on the coastal-marine resources as their primary source of income. In reality, as the resident populations in the area lack permanent employment options that can absorb unemployed labor, this encourages overexploitation of the resources in the area (ACD, 2007).

Vessel	Size	Tariff	Capacity
Artisanal fishing	Up to 35 feet	$10.00 annually. To be reviewed from January 2010	Up to 5 fishers
Commercial Sports Fishing Vessels			
Yachts	Any size	$10.00 monthly per foot boat length	Up to 4 fishers plus the captain
Boat/Panga	Up to 27 feet	$2.50 monthly per foot boat length	Up to 4 fishers plus the captain
Boat/Panga	Greater than 27 feet	$5.00 m monthly per foot boat length	Up to 5 fishers plus the captain
Recreational Sports Fishing			
Yacht	Any size	$5.00 monthly per foot boat length	Up to 4 fishers plus the captain
Boat/Panga	Up to 27 feet	$2.50 monthly per foot boat length	Up to 4 fishers plus the captain
Boat/Panga	Greater than 27 feet	$5.00 monthly per foot boat length	Up to 5 fishers plus the captain
Others	Greater than 27 feet	$5.00 monthly per foot boat length	Up to 4 fishers plus the captain
Scientific Fishing			
Any vessel	Any size	$150.00 annually	Depending on vessel requirements

Table 12: Proposed tariffs for Fishing Licenses in the PNC
Source: Coiba National Park Sustainable Fish Harvesting Plan and Regulations (February, 2009).
Note: ANAM is currently going through the final consultation phase to make these tariff changes.

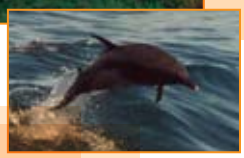
Apart from subsistence fishing boats, all artisanal, sports fishing, tourism (recreational and commercial) and scientific vessels that enter the PNC must have a license provided by ANAM. This license is non-transferable, non-divisible and individual, and must be requested from the Headquarters of ANAM in Punta Gambote, Coiba Island. Park Authorities (wardens) with the appropriate identification may make detailed inspections of vessels while these are within the limits of the protected area.

The number of artisanal fishing licenses in the PNC is limited to 47 vessels. Currently, there are 41 licensed artisanal fishing vessels in the Park. However, the Executive Committee will determine the requirements for the remaining six vessels to obtain their permits to operate within the Park. According to the current regulations, these permits allow the exploitation of a maximum of two fishery resources, which cannot be changed during the year: snapper, grouper and dolphinfish.

Permits issued by ANAM are valid for eight days (artisanal and sports fishing permits) or one year (subsistence fishing permit) but have the following restrictions:

1. There is a maximum of two permits per month per vessel.
2. The artisanal fishing vessel must have been on the Artisanal Fishing Register at the moment Law N°44 of 2004 was passed.

In accordance with current legislation, the permitted types of fishing gear are handlines, trolling lines, artisanal rod and vertical drift line, and subsistence (only cord is permitted). Sports fishing permitted techniques include catch and release with the use of circular hooks, and regulations on lines, reels, wire and hooks. Fishing with explosives or chemicals, by free diving or SCUBA are all prohibited, as are harpoons, dredges, beach seines, trawl nets, longlines, Hawaiian slings, and any type of leader lines connecting hooks to a motherline. Those vessels authorized to fish within the PNC are forbidden to carry unauthorized fishing gear or protected species while they remain in, or pass through, the protected area.



Stakeholders

Public Sector Stakeholders

Name of Institution (Public Entity)	Role in MPA	Role of Civil Servant
National Environment Authority (ANAM)	Governing Agency	National Director of Protected Areas. Member of the PNC Executive Committee.
National Environment Authority (ANAM)	Governing Agency	Head of Department of Protected Areas.
National Environment Authority (ANAM)	Governing Agency	ANAM Regional Administrator.
National Environment Authority (ANAM)	Governing Agency	Director of PNC.
Ministry of Government and Justice (MGJ)	Decision-making advice	Legal Advisor from MGJ. Member of the PNC Executive Committee.
National Police	Security	Sub-commissioner. Head of the Zone.
Panama Tourism Authority (ATP), previously IPAT.	Decision-making advice	ATP Lawyer. Member of the PNC Executive Committee.
National Science, Technology and Innovation Secretariat	Decision-making advice	Engineer. Coordinator, Department of Science and Technology Indicators, SENACYT. Member of the PNC Executive Committee.
Panama Aquatic Resources Authority (ARAP)	Decision-making advice	Regional Administrator. Member of the PNC Executive Committee.
Montijo mayor's office	Decision-making advice	Mayor. Permanent Member of the PNC Executive Committee.
Soná mayor's office	Decision-making advice	Mayor. Permanent Member of the PNC Executive Committee.
Las Palmas mayor's office	Decision-making advice	Mayor. Permanent Member of the PNC Executive Committee.
Mariato mayor's office	Decision-making advice	Mayor. Permanent Member of the PNC Executive Committee.
National Aeronaval Service	Security	Coordinator
University of Panama- Veraguas Central Regional University (CRUV)	Decision-making advice	Faculty Professor CRUV. Member of the PNC Executive Committee.

Table 13: Public Sector Stakeholders

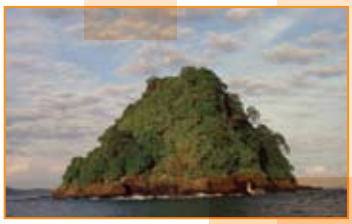
Private Stakeholders

Stakeholder	Type of Stakeholder: Public, Private, Community, NGO, other	Type of Attitude or Commitment to the Management of the MPA
Veraguas Chamber of Commerce	Private	Stakeholder. Member of the PNC Executive Board. Decision-making advice.
National Association for Nature Conservation (ANCON)	National NGO	Sustainable development projects with communities in the area of influence of the PNC. Member of the PNC Executive Board. Decision-making advice
MarViva Foundation	National NGO	Collaboration with MPA auditing and elaboration of sustainable development projects with communities in the area of influence of the PNC. Member of the PNC Executive Board. Decision-making advice
Smithsonian Tropical Research Institute	Scientific Research	Scientist. Coordinator of the technical team which drew up the PNC Management Plan
Smithsonian Tropical Research Institute	Scientific Research	Scientist. Member of the PNC Executive Board. Decision-making advice.
Smithsonian Tropical Research Institute	Scientific Research	Scientist
National Federation of Artisanal Fishers (FENAPESCA)	Private	Stakeholder. Member of the PNC Executive Board. Decision-making advice.
Foundation for the Conservation of Nature and Marine Species (CONMAR)	Private	Conservation activities. Member of the PNC Executive Board
Conservation International	International NGO	Donor for marine management projects.
Nueva Bahia Honda Association	Community Association in formation	Stakeholder. Carries out low impact tourism activities in the MPA buffer zone.
ARTURIS	Community Association in formation	Stakeholder. Commercial activities in the MPA buffer zone
Liquid Jungle Lab	Private	Scientific research
Albatross Foundation	National NGO	Carries out sustainable development projects with communities in the MPA area of influence.
Center for Environmental Advocacy (CIAM)	National NGO	Carries out sustainable development projects with communities in the MPA area of influence.

Table 14: Private Sector Interests in the PNC

Analysis of Context/Governance

When Law N° 44 (2004) went into effect, a novel participatory management mechanism for the PNC was introduced via the creation of an Executive Committee made up of 16 representatives (of which only 12 have the right to vote) from State institutions and local government, civil society and scientific institutions. By law, the presidency of the Committee is held by ANAM, as is the administration of the protected area under the norms established by the Management Plan. The aforementioned Law also establishes a pro-bono Scientific Committee, with the objective to provide support for the Executive Committee on the establishment of projects and to facilitate technical assistance. In addition, a Commission for the Sustainable Management of Fisheries within the ZEPM, works to collaborate with regulating harvesting activities in the ZEPM and design policies for sustainable use and conservation of the marine resources present there.



The main difficulties found in terms of governance are linked to the lack of commitment on behalf of some of the local government representatives and also some institutional representatives in the Committee meetings during the period when this study was carried out (lack of participation and/or irregular attendance). This situation is self evident upon analysis of the minutes of 27 Executive Committee meetings that we reviewed. During the period from November 15th, 2004 to February 6th, 2009, there was a poor level of participation of the mayors of the districts of Montijo (37%), Río de Jesús (40%) and Soná (62%); all of which are in the PNC buffer zone. The Veraguas Chamber of Commerce displayed a similar poor level of participation (37%) and the Ministry of Government and Justice (66%), the latter of which has particular functions within the protected areas that need to be reinforced. The following graph displays participation levels.

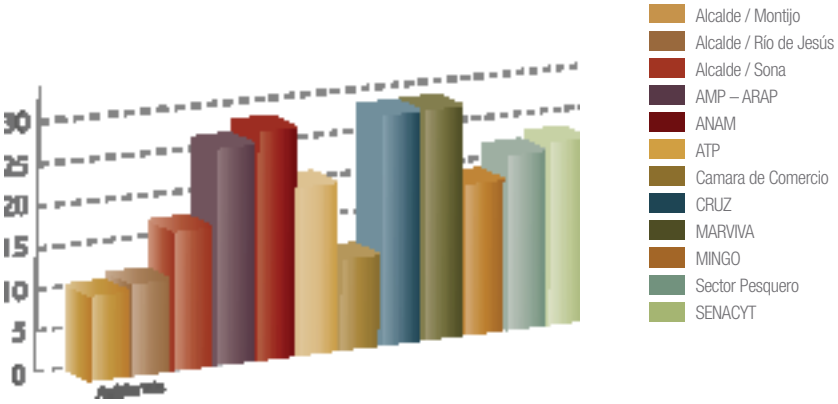


Figure 4: Participation and attendance at the PNC Executive Committee

In contrast, there have been repeated requests to give the artisanal fishers greater representation in the Executive Committee, given their geographic representation. Other unresolved problems in the area are linked to the lack of an efficient and effective financial mechanism, and to the presence of the Ministry of Government and Justice, represented in the PNC by the Ecological Police. A detailed analysis of the Executive Committee and associated commissions is urgently required in order to evaluate their effectiveness, credibility among direct and indirect users, and the management of their financial accounts (Suman 2007).

Several interviewees agreed that part of the problem of natural resource management is related to the lack of communication between agencies or administrations; to which must be added the confusion caused by unclear and/or contradictory legislation. From this perspective, Panama appears to lack an effective coordination among the different authorities that affect the coastal zone. This is evident from the complex relations that arise in the management of marine and terrestrial areas in the PNC. The Park Executive Committee , which brings together various government agencies, research groups, and representatives of civil society, will play a decisive role in the overall management framework. This will require the restructuring and training of personnel, along with a broad training and technical assistance program to ensure effective participation by all key actors in the area. Unlike other countries in the region, coastguards in Panama do not maintain a permanent coordinated presence in the enforcement activities of MPAs. This is a weakness, which could be resolved very easily.

Surveillance and Detection

Personnel

The current administration structure in the protected area is based, in theory, on a vertical chain of command with a Head of the Protected Area, two shift managers, 18 Park Wardens (9 on each shift) and one secretary based on the mainland in Santiago de Veraguas, 30 minutes from the port of Montijo. However, the PNC only has 14 Park Wardens, of which 7 are on permanent contracts. The Head of the Protected Area is subject not only to the authority of the ANAM Regional Administrator in Veraguas, but also to the directives of the Regional Head of Protected Areas, and the ANAM National Directorship of Protected Areas and Wildlife which can complicate their job performance. Salaries for personnel are on average US$300 per month. These are low and insufficient considering the conditions and responsibilities implicit in staying at the PNC, especially given the rise in cost of living over the last few years. Personnel are assigned to the PNC on shifts of 15 continuous working days, followed by 15 days of rest.

Within these parameters, it is hard for the shift managers to carry out enforcement activities when they have to deal with the bureaucracy of issuing permits for artisanal and sports fishing, personnel supervision, Park entry and accommodation fees, supervision of cleaning and maintenance of cabins, basic services, communications, accounting, and the fortnightly deposits of the PNC income. It is evident that the majority of activities carried out by Park Wardens are administrative, as both the operation center and visitor cabins are located in the vicinity of the enforcement unit. In addition, there is no Employee Handbook for the PNC personnel or defined work programs.

The Ecological Police maintain a reduced force at the old barracks at the Central Penal Camp at the Damas Bay Inlet. They collaborate with enforcement activities, but lack equipment required for mobilizing these additional activities.

Training

Most Park Wardens only have basic schooling and minimal training in management techniques for protected areas. The only courses they may have received are:

- Diving
- First Aid
- Outboard motor operation
- Trail interpretation
- Environmental education
- Mammal identification

There is little training in handling high-risk situations as Park Wardens do not possess the power of arrest and must be accompanied by members of the Ecological Police.

PNC Financing

It is important to note that government support for the PNC has been very limited. In effect, the lack of assigned resources and the difficult access to the area has translated to low or limited presence in the buffer zone. The PNC operation funds come primarily from the investment budget of ANAM and from annual investments by the Panama Ecological Trust Fund (FIDECO), administered by NATURA.

Source	2002	2003	2004	2005	2006	2007	2008	Total (US$)
FIDECO	$20,000	$23,000	$36,682	$60,375	$69,277	$60,000	$156,400	$425,734
ANAM	$67,800	$67,800	$67,800	$12,478	$45,000	$61,000	$60,744	$382,622
TOTAL	**$87,800**	**$90,800**	**$104,482**	**$72,853**	**$114,277**	**$121,000**	**$217,144**	**$808,356**

Table 15: PNC Finances 2002-2008

In addition, financial support from the international community, including Conservation International, The United Nations Foundation, UNESCO World Heritage Center and the Walton Foundation, has been channeled via the Coiba Coalition Group . These funds are dedicated to promoting sustainable development projects in the area of influence of the PNC and to support protection and management of the protected area.

Institution	Contribution (US$)
STRI	$40,000
Fundación Natura	$7,700
Fundación MarViva	$558,000
ANCON	$10,267
Conservation International	$90,000
UNESCO/CI/UNF	$28,000
TOTAL	**$733,967**

Table 16: External support for PNC management, 2008

"A la carte" menu

In the past, some Park Wardens have even offered overnight visitors the chance to choose their meals from fish or animals caught and cooked by the very people who have the legal obligation to protect them.

One last outstanding figure is the annual income for PNC in 2008, which reached US$259,124, from cabin rentals, visitor entry fees, anchor fees, sports fishing permits and other activities (ANAM 2008). Law N° 44 (2004) establishes the PNC Fund with the objective to carry out the responsibilities stated in the law. This fund should be used for investment and administration costs of the PNC, with special emphasis on projects related to management, protection and conservation. The estimated cost of implementing the PNC Management Plan under a minimum-funding scenario is **US$13.7 million over the next five years.** It is clear that there is a huge gap between the budgeted costs and the availability of funds.

Detection Probability

Enforcement Vessels and Applied Technology

The PNC has six “coastal” vessels for transport and patrolling, each with their respective outboard motors. Although PNC personnel claim that only one vessel was not operational when this study was carried out, the residents of the buffer zone informed us that only one ANAM vessel was patrolling the area. The size of the ANAM vessels in the PNC range from 26 to 30 feet and their top speeds are between 12 and 40 knots. In addition to these, there is also a marine patrol team provided by MarViva, made up of three additional vessels. The ANAM patrol vessels are inactive for most of the year, due to the lack of a repair budget, which is why the collaboration of the MarViva vessels is so important.

Only one of the vessels, the *Coral V*, is suitable for interception; the remaining vessels are more suited to monitoring or logistical activities. The MarViva vessels must be added to these. The replacement of one of the slower vessels with a high-speed one is required, along with greater coordination with the MarViva vessels. Encompassing all these, the main problem is still the need for constant vessel maintenance.

Of all the equipment we were asked to investigate (radar, HF, VHF and UHF communications, night vision equipment, satellite phones, video and photographic cameras), the PNC vessels only possessed one video camera and two photographic cameras. Park Wardens did not even have basic field and personal safety equipment. Apart from uniforms and field boots, there is no camping gear, compasses, personal radios, binoculars, GPS or other individual equipment or first aid supplies.

Organization and Planning for Patrols

The Panamian authorities do not have enough resources to cover the territorial sea and exclusive economic zone. The main reason for this is that there are not enough patrol boats, and for those that they possess, there are not enough resources to ensure that they are operational. In most cases, they only patrol areas in the vicinity of their operations base. Even when vessels and fuel are available, there are not enough personnel to operate them.

In general terms, the organization of enforcement activities is poor. In many cases before 2007 it is hard to find records of the number of vessels visiting the protected area and, as we mentioned earlier, the Park Director spends much of his time carrying out administrative tasks. As a result, there is a lack of reliable information on the fishing fleets operating within the PNC, landings, and fishing efforts. Along with the poor capacity of the authorities to patrol the fishing zones, and the lack of information on the biology of exploited species, these all have created unfavorable conditions for the appropriate management of marine resources in the PNC.

There is a lack of political will on behalf of the government authorities to enforce the existing regulations or to provide the proper resources to carry out these activities. The illegal gear used by artisanal fishers are net traps which capture juvenile shrimp and fish at the mouths of estuaries; and industrial vessels trawl in areas close to the coast. Both are negatively impacting the sustainability of fisheries. Finally, there is also a sense of impunity among those involved in fishing activities who feel that they do not need to comply with existing regulations. This contributes greatly to a lack of compliance or acceptance of control methods.

Electronic Monitoring Systems for Vessels in Panama

In 2007 a law was passed which obliges boat owners to place satellite-monitoring equipment on their vessels so that ARAP might improve their control of the territorial waters. As a result, the state institution would be able to determine who is carrying out fishing activities in closed areas or areas other than those authorized. However, the implementation of this law has been delayed on various occasions as vessel owners have not installed the equipment and have not been sanctioned as a result. This is not only an issue of illegal fishing and resource management within the PNC, but involves national security interests and over 300 vessels registered in Panama, which are dedicated to fishing in national waters, and another 180 dedicated to fishing in international waters.

Analysis of Detection Probability

Coiba National Park covers an area of 785 square nautical miles in the reserve zone, and 468.58 in the Special Protection Zone, which give a total area of 1,254.49 nm^2.

According to the equation defined at the beginning of this publication, detection probability should be estimated with the following site conditions and patrol strategy:

Sweep width: 6 to 10 miles visual and 8-16 nautical miles by X Bandwidth navigation radar for small vessel detection.

Distance covered: Variable between 50 and 450 nautical miles.

Area to explore: 1,243.49 nm^2.

Under these parameters, the detection probability is as follows:

Coiba MPA – Panama

Distance Covered (nm) or Hours Patrolled nm/120	Maximum Effective Detection Distance nm							
	6	8	10	12	14	16	18	20
30	13.48%	17.55%	21.44%	25.14%	28.66%	32.02%	35.23%	38.28%
40	17.55%	22.69%	27.51%	32.02%	36.26%	40.23%	43.96%	47.45%
50	21.44%	27.51%	33.11%	38.28%	43.05%	47.45%	51.51%	55.25%
60	25.14%	32.02%	38.28%	43.96%	49.11%	5 3.79%	58.04%	61.90%
70	28.66%	36.26%	43.05%	49.11%	54.53%	59.37%	63.70%	67.56%
80	32.02%	40.23%	47.45%	53.79%	59.37%	64.28%	68.59%	72.38%
90	35.23%	43.96%	51.51%	58.04%	63.70%	68.59%	72.82%	76.49%
100	38.28%	47.45%	55.25%	61.90%	67.56%	72.38%	76.49%	79.98%
110	41.18%	50.72%	58.71%	65.41%	71.02%	75.72%	79.65%	82.95%
120	43.96%	53.79%	61.90%	68.59%	74.10%	78.65%	82.40%	85.49%
130	46.60%	56.67%	64.85%	71.48%	76.86%	81.23%	84.77%	87.64%
140	49.11%	59.37%	67.56%	74.10%	79.32%	83.49%	86.82%	89.48%

Table 17: Detection Probability in the PNC

If we consider a patrol velocity of ten knots using small vessels, it is clear that the efficiency is poor even when patrol operations cover 100 nm (that is approximately ten hours of patrolling), which is not recommended for small vessels. In order to achieve a detection probability of greater than 75%, a vessel would need to cover between 120 and 180 miles, between 12 and 18 hours of patrolling, and have equipment able to detect other vessels at distances greater than 12-16 miles (the other vessels would have to be very large).

On the other hand, the speedboats available are made of fiberglass. In order to cover the area in a timely manner patrols need to be planned with the simultaneous use of two vessels; one active, and the other one as backup to cover for maintenance issues. It is important to incorporate an autonomous oceanic vessel that can operate at sea for several days. The maximum detection distance is smaller for a wooden or artisanal vessel, making detection even more difficult, especially as it is mostly done on a visual basis.

In conclusion, effective enforcement of this area requires at least three vessels and a crew of 9-12 men for onboard tasks. This is currently only available through the support of MarViva and other organizations. If a future budget permits, an oceanic vessel with a crew requirement of four to six men should be incorporated. As we mentioned earlier, the PNC has a serious vessel maintenance problem that must be urgently addressed. We do not recommend adding new vessels until this problem is solved.

In the area located en route to the mainland, oceanic vessels are not required. Rather, rapid response speedboats would be more appropriate in contrast to the needs of the ocean side of the protected area. We also recommend the addition of land-based radar and the use of boats only for interception. This would also reduce recurrent costs for fuel and the need for backup crews.

Interception and Arrest

According to the Park Wardens, the most common violations in the PNC are boats, which do not carry the corresponding fishing permits to carry out the activity in the protected area, or which do not use permitted fishing gear. All the ANAM vessels are coastal, and only the *Coral V* (besides the MarViva boats) can reach a high enough maximum speed in order to intercept other vessels (40 knots). In contrast, interviews carried out with managers of processing plants with their respective warehouses, show that the fishing fleets of both processing plants operated within park borders (Vega, 2006), and even provided estimated annual catches of around 360,000 pounds, assuming that each shipment to Miami airport is approximately 10,000 to 15,000 pounds (Maté et al, 2007). However, there is not enough information to confidently estimate the total commercial value of industrial fishing in the zone.

It is highly probable that areas within, and surrounding the PNC are susceptible to overfishing. This affects both the fragile habitats of the marine protected area and the new species that are being reported by scientists. **In fact, just as in other areas of the country, fishers perceive a huge increase in the number of boats over the last few years, which they believe is the cause of the decline in fish populations.** Finally, although industrial fishing in Coiba is prohibited according to current law; the activity is carried out in the adjacent ZEPM.

Note: One of the main problems reported by commercial ("artisanal") fishers is the presence of shrimp fishers and artisanal trawlers who operate in areas close to the coast and carry out industrial fishing in areas where they are not permitted. The percentage of catch coming from the Gulf of Chiriqui is unknown, but the reduction in average size seems to indicate possible overexploitation.

Boarding Procedure and Crime Scene Investigation

There is rarely a detailed investigation and compilation of evidence at the crime scene as training and preparation are almost non-existent. However, many of the processes initiated do end with a sanction. Perhaps this is because the violations are obvious and the violators do not possess the resources to hire lawyers who can find errors in the investigative procedures.

MarViva does not report illegal activities within the Park; it simply informs ANAM as part of its collaboration. However, strong economic interests exist and so does impunity for an owner of several vessels that have been caught repeatedly violating the PNC regulations. To date, this person has not been sanctioned and it was not even possible for us to see the files of the case(s) which has (or have) been brought against him. One of the members of his consortium is also part of the ARAP Board of Directors.

MarViva recently published a document that provides guidelines for boarding operations. In addition, based on Resolution AG-0118-2005 (February 24th 2005), which empowers ANAM Park Wardens to board and inspect vessels which request permission to fish or are fishing in the PNC, it appears that the process employed is as follows:

1. The captain is requested permission to board.
2. They are required to show their sport fishing or artisanal fishing permit, and if they do not have one, the vessel is taken outside the Park boundaries.
3. The containers are inspected to verify whether they contain marine products that are not permitted inside the Park (shark fins, lobster, conch).
4. The fishing gear is inspected to ensure that the number of hooks, buoys etc correspond to the permit.

Correct Presentation of Documents to the Administrative or Judicial Sanction Process

The procedures used to compile and manage evidence on the vessels were published in an enforcement handbook produced by ANAM with the support of the National Police and MarViva. If a vessel is detected committing a sports fishing or artisanal fishing violation within the PNC limits, the fishing gear and the catch are seized, and the process is filmed and photographed. Following this, a violation report is filled, along with sworn statements, and these are sent to the PNC offices at Veraguas, so that the Legal Department can give instructions on the following legal procedures. The catch is weighed and donated to schools or charity organizations in the vicinity of the PNC.

Relation between Violations Detected and Intercepted

Some communities have reported irregularities in the PNC. However, in most cases they complain that they have reported violations to the authority but nothing has been done. It must be noted that in some cases it is the local communities that commit the violations. There are no official records of this and our investigation had to be based on stakeholder opinions.

Conflicts of Interest

Industrial vessels belonging to a member of the ARAP Board of Directors were captured within the PNC limits on more than one occasion. ARAP is the same authority that sanctions illegal fishing outside protected areas. This situation angers environmental organizations and even fishing cooperatives, who have found that their complaints fall on deaf ears. It is important to note also that the local newspapers make constant references to foreign vessels, even those from Costa Rica, which enter and fish in Coiba.

Prosecution

Speed and Efficiency of Administrative Processes

Although the ANAM Administrator can apply sanctions of up to US$1 million, and the National Environmental Board can impose fines of up to US$10 million, the sanctions normally applied in these cases range from US$25 to US$300, and reach a maximum of US$1,500 only in a few cases.

Year	No. Open Cases	No. Solved Cases	No. Cases pending	Time (in days) to process cases (average) and comments
2004	2	1	0	• Settled after 21 months • 1 shelved due to lack of evidence
2005	5	3	0	• 1 shelved due to lack of evidence • Shelved because accused could not be located • 3 settled after 1-4 months, with fines of $500, $1,000 and $1,500.
2006	6	5	0	• 5 settled after 4-16 months • 1 shelved for scientific reasons
2007	9	9	0	• 6 settled in 1 month • 2 settled in 4 months • 1 settled in 5 months • Fines between $100 - $300
2008	18	9	9	• 9 settled between 1-5 months • 9 pending between 6 -12 months
2009	3	0	3	• Cases opened between March and May

Table 18: Summary of PNC Processed Cases

Speed and Efficiency of Administrative Processes

There is not a lot of experience in the application of the penal code for violations within the PNC. Four cases, which fall under the penal system, have been detected. Although proceedings were initiated over two years ago, none have received sanctions to date. One of these cases has been provisionally dismissed due to the lack of evidence in proving that a crime was actually committed.

Proportion of Unresolved Cases

Over the study period we found a total of 43 cases, of which nine are still under investigation (initiated between July 2008 and May 2009), two have been shelved due to lack of evidence and three have been concluded, but the violator has not been located. In the latter events, this has implied an average of US$225 in uncollected fines. The remaining processes have all been concluded with fines that have been paid, with the exception of one case which was not penalized because the sharks captured were for scientific purposes.

Proportion of Cases Presented and Cases Admitted

All cases presented to the administrative or judicial authorities are accepted, although evidently not all result in a sanction.

Monitoring Penal Processes

Although the Authorities may participate in the processes, they tend to wait until the investigating organism requests copies of documentation or further information regarding evidence, without really taking an active role during investigations.

Sanctions and Sentencing

Ratio of Processes Initiated and Sentences

Of the 43 processes initiated between 2004 and 2009, 32 culminated in a resolution (an effectiveness of 74.4%). Of these, 28 ended with sanctions, one was absolved and three of the accused were unable to be located, so the fine was not paid. Real effectiveness was therefore 65.11%.

Length of Process

Some processes (9 out of 43) are still being investigated, even though several were started over two years ago.

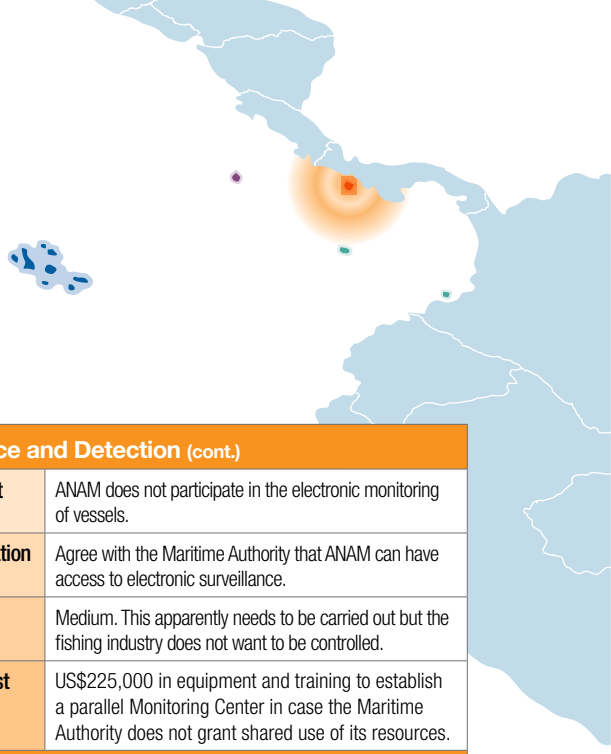
Sanctions Implemented

Of the sanctions imposed, three have not been carried out because the guilty parties have not been located, while the other six are in the process of being implemented. The rest of the fines were collected by ANAM. There are a total of 43 cases, either completed or under investigation by ANAM for alleged environmental violations, two of which were initialized by means of citizen complaints.

Flagrant Impunity

Fishers who have reported the use of illegal fishing gear have seen how their complaints fall on deaf ears as the fishing gear is returned to the violators, they are not sanctioned, and return to continue fishing illegally the next day.

In 2005, the Penal Code of the Republic of Panama was substantially modified. A new heading, "Offenses against the Environment" was incorporated, which outlined sanctions for persons who promote, cause, sponsor or direct damaging activities to the environment, causing them to be disqualified from holding a public position for three years. In addition, Article 401 stipulates sanctions for persons who fish, hunt, kill, capture or extract protected or threatened marine and terrestrial wildlife species or resources without the appropriate permits or, in the case that a permit is held, if the conditions of the permit (size, amounts, age) are not met.



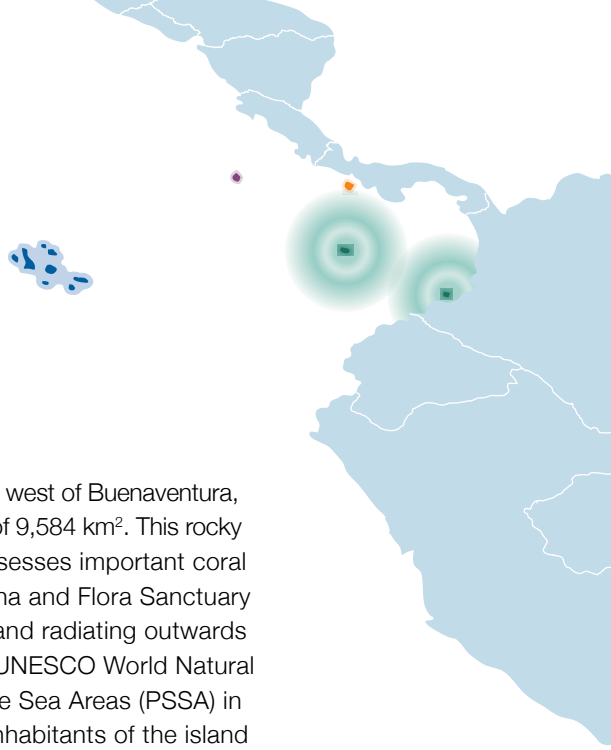
Recommendations
Coiba National Park, Panama

Surveillance and Detection	
Critical Aspect	Limited personnel, low salaries.
Recommendation	1) Employ another 9 to 12 Park Wardens as permanent crew for patrol vessels. 2) Salaries should be evaluated to determine whether their levels are in agreement with State salaries, and if they are below, they should be raised and standardized. Evaluate the possibility of providing additional per-diem.
Feasibility	Medium. Requires commitment of the PNC to cover the costs in the long term as a budget item.
Estimated Cost	1) $43,200 to $57,600 per year for additional personnel 2) Between $15,000 and $18,000 to improve salaries of current personnel.
Critical Aspect	Institutional weakness of PNC.
Recommendation	Produce organization, roles and procedures handbooks and implement a Human Resources development and training plan.
Feasibility	High. ANAM is interested and it could be implemented rapidly.
Estimated Cost	US$50,000 and twelve months of work to include a definitions phase (4 months) and a follow up phase (8 months).
Critical Aspect	Low vessel availability due to poor maintenance.
Recommendation	Establish an Assistance or Support Agreement with NGOs to obtain funds to hire a permanent mechanic, tools and spare parts for existing vessels.
Feasibility	There is political will. The cost-benefit ratio of this action is optimal.
Estimated Cost	USD $60,000 per year.
Critical Aspect	Lack of surveillance equipment (boat fittings, detection equipment, binoculars, GPS, radios, survival kits, etc).
Recommendation	1) Improve budget distribution. 2) Develop agreements with friendly governments and NGOs. 3) Install a radar station on the island operated by ANAM and coastguards.
Feasibility	1) High. This could be managed by means of a donation and PNC counterpart funds. 2) Requires greater authority given to Park Wardens and coordination with other State agencies.
Estimated Cost	1) US$50,000. 2) No cost. 3) $60,000.

Surveillance and Detection (cont.)	
Critical Aspect	ANAM does not participate in the electronic monitoring of vessels.
Recommendation	Agree with the Maritime Authority that ANAM can have access to electronic surveillance.
Feasibility	Medium. This apparently needs to be carried out but the fishing industry does not want to be controlled.
Estimated Cost	US$225,000 in equipment and training to establish a parallel Monitoring Center in case the Maritime Authority does not grant shared use of its resources.
Critical Aspect	Lack of infrastructure for Park Wardens (no control posts).
Recommendation	Financial investment for at least two control posts.
Feasibility	High. There is interest from ANAM.
Estimated Cost	US$50,000.
Critical Aspect	Lack of awareness in neighboring communities
Recommendation	Begin awareness campaigns with community organizations involved with the PNC.
Feasibility	High but must be linked to an awareness of the benefits to the community, which is derived from the management of the area.
Estimated Cost	US$70,000.
Critical Aspect	Limitations in operational budgets and rules for expenditure. No financial autonomy.
Recommendation	1) Design a plan to raise funds directly for the PNC (regulate tariffs, donations, State assignation etc) and implement regulations for its administration. 2) Provide the PNC with sufficient autonomy to cover minimum operational funds with activities (tourism, diving, fishing). 3) Create a trust fund.
Feasibility	Medium. Needs to go through political channels.
Estimated Cost	US$35,000 to cover costs of advisors, transport and technical assistance.

Interception and Arrest	
Critical Aspect	No permanent presence of coastguards to support enforcement in the PNC.
Recommendation	Agreement and Operational Procedures between ANAM and Coastguards.
Feasibility	Medium. Requires facilitation, which could be provided by an NGO.
Estimated Cost	USD$20,000 to US$25,000 for a 6-9 month process.
Critical Aspect	Poor Park Warden training.
Recommendation	Coherent and integrated training of Park Wardens and national police who work in the Park, following international recommendations and minimum required courses for the execution of these functions and for work at sea. Special emphasis should be placed on boarding procedures and crime scene investigation.
Feasibility	Medium. ANAM should be involved to promote these activities on a permanent basis. External assistance or professional exchanges may be required to accelerate the learning curve. These could be arranged via NGOs and friendly governments.
Estimated Cost	US$45,000. Cost depends on courses, trips and seminars required according to market prices or NGO or Government support.
Critical Aspect	Lack of independence in the secretariat of the PNC Executive Committee.
Recommendation	Separate appointment of the Committee members, in order to obtain greater management independence Launch campaign to raise awareness and create citizen pressure and political will.
Feasibility	Low, due to the current lack of political will Very important action (for example, ANAM occupies the Presidency of the Committee, and MarViva is the secretary).
Estimated Cost	US$80,000.
Critical Aspect	Lack of capacity to monitor processes underway.
Recommendation	1) Hire a lawyer and/or agreements with eduactional centers (universities). 2) Explore possibility for NGOs to follow up cases or present private accusations.
Feasibility	High, especially for cooperation agreements with Law Schools (internships).
Estimated Cost	US$40,000.

Prosecution (cont.)	
Critical Aspect	Overlapping or insufficient regulations.
Recommendation	Review of existing legislation and preparation/presentation of legal initiatives to fill gaps (diving, coral reef fish, etc), as well as assigning responsibilities and decision-making level to those involved.
Feasibility	Medium. Specialized international organizations, friendly governments and NGOs should be called upon to support the initiative.
Estimated Cost	US$ 50,000 to cover the cost of consultancies, staff training and trips which will permit the design of legal needs.
Critical Aspect	Head of PNC has limited authority, command and jurisdiction.
Recommendation	Assign greater administrative-operational decision powers. Train group director to improve his position as an authority and generate respect for his position.
Feasibility	High.
Estimated Cost	Negligible costs.
Critical Aspect	Fisheries Authority, made up of members of the sector, block sanctioning processes.
Recommendation	1) Re-constitute the Board of Directors with a government majority or at least that of institutions related to fisheries management rather than delegates from the sector. 2) Choose representative cases and launch dissemination campaign among the community until it is reformed.
Feasibility	Low. Reforms to the Law and political will of the Central Government are required.
Estimated Cost	1) Political costs. 2) US$75,000.
Critical Aspect	Impunity: slow provision of justice or loss of cases.
Recommendation	1) Establish a program of legal assistance for the PNC and ANAM which permits prosecution of cases as a support to the administrative authority or as a public or private plaintiff. 2) Fishing gear should be confiscated and destroyed in administrative cases. 3) Allow the MPA Director to impose administrative sanctions.
Feasibility	Medium. ANAM would be interested, implementation is simple, and results would be immediate. However, the action would generate a response from those affected, and a political reaction should also be expected.
Estimated Cost	1) US $30,000 per year to hire an ANAM lawyer. 2) No cost. 3) US$15,000.



Malpelo Fauna and Flora Sanctuary and Gorgona National Natural Park
Colombia

Description of the Islands

The Malpelo Fauna and Flora Sanctuary (SFF), located 500 km to the west of Buenaventura, in the Pacific Ocean, has a terrestrial area of 3.5 km^2 and a marine area of 9,584 km^2. This rocky archipelago is made up of Malpelo Island and eleven islets, and possesses important coral formations and significant marine biodiversity. It was declared a Fauna and Flora Sanctuary (SFF) in 1995; demarcated by a square centered on Malpelo Island and radiating outwards for 25 nautical miles to each axis. In 2006, Malpelo was declared a UNESCO World Natural Heritage Site, and was placed on the IMO list of Particularly Sensitive Sea Areas (PSSA) in 2002. There are no nearby ports or coastal communities. The only inhabitants of the island are Navy, SFF, and Malpelo Foundation staff, along with volunteers and occasional visits from tourists who come to scuba dive.

Gorgona National Natural Park (PNN), located at 56 kilometers off the coast of Guapi in the Pacific Ocean, spans a total area of 61,687.5 hectares (Gorgona, Gorgonilla and marine area), of which 598.36 km^2 correspond to the marine area. The site possesses a small example of tropical rainforest with a diversity of coral formations and presence of migratory species. Nearby communities are located on the north coast of the Nariño Department, and along the coast of the Guapi Municipality. Prevailing marine currents are south to north with strong winds occurring in the latter half of the year. Transport is via boat from Buenaventura (12 hours) or Guapi (90 minutes).

Socioeconomic Value

Malpelo Tourism: Seven dive tour boats currently operate at Malpelo SFF, of which three are based in Buenaventura (*M/N María Patricia, M/N Doña Mariela, M/N Anita*) and have a capacity for 10-25 scuba divers and autonomy of 12 to 25 days. A further two Panamanian boats and two Costa Rican vessels operate with an autonomy of 15 and 30 days, and a capacity for 8 and 18 divers. Another Costa Rican vessel was expected to start operations at Malpelo before the end of 2009. There is a set of Regulations for the Use of the Area (which went through a prior consultation process) that establishes that only one vessel may be present at the island at any given time. Dive tourism is characterized as being exclusive and expensive: the average cost per 12-day visit is US$3,500. Approximately 600 people visit the island each year and pay US$60,000 in park entry fees.

Gorgona Tourism: Gorgona Island previously housed a penitentiary. The Gorgona PNN has given tourist concessions to the following tour operators: Aviatur, Malpelo Foundation and Avia. The park entry fee is collected directly by National Natural Parks, in accordance with the official established tariffs. In recent years accommodation on the island has improved, resulting in an increased entry fee. There are social programs for people with low income, especially school groups, and various package tours are offered. Access to the island is via two vessels that leave from the port of Guapi and a timber boat, which leaves port at Buenaventura. Around 4,500 people visit Gorgona PNN each year.

Description of the Colombian Fishing Fleet : Fishing can be either industrial or artisanal. There are approximately 15,000 artisanal fishers in the Pacific. The most common gear used are nets for whitefish and shrimp (beach seines, trammel nets, cast nets), longlines and handlines for whitefish, used in vessels up to 15 meters long which in some cases have navigation equipment that give them an autonomy of up to two weeks. According to the report we consulted, industrial fishing in the Pacific began in the 1950s, for tuna and shallow water shrimp, both of which became important in the eighties.

In 2006, the Ministry of Agriculture and Rural Development and the Colombia International Corporation (CCI) produced a report on fishing and aquaculture, which contained the following information: "The catches recorded and landed in the four Pacific municipalities, along with tuna and whitefish landings at Cartagena and Barranquilla caught in the Eastern Pacific Oean (EPO) for 2007 were 78,205 metric tonnes, corresponding to a decline of 9.4% with respect to 2006 (86,277.77 tonnes). Industrial fishing made up 74,006t (94.6% of the total) whereas artisanal fishing accounted for 4,199.5t (5.3%). Fisheries in 2007 totaled 76,527.5t, a decline of 8.6%, whereas crustacean products declined by 34% with respect to 2006 (1,659t). The artisanal catch (4,199.5t) was made up of 47 species. 51.5% of this (2,162.2t) was landed at Buenaventura, and 36% (1,520.6t) at Tumaco; these volumes showed an increase of 18.2% with respect to 2006.

Fraction of GDP represented by national fisheries 2000–2007
(estadísticas DANE)

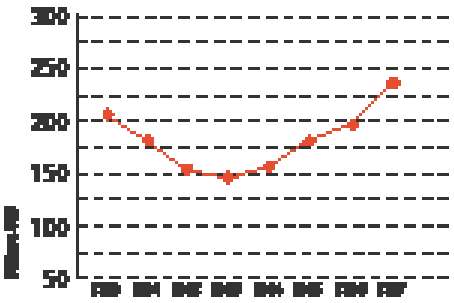


Figure 5: Contribution of Fishing to Colombia's national GDP

Artisanal and Industial Fish Landings Colombian Pacific Ocean 1995–2006: Average 87860 tonnes/year
(statistics INPA, INCODER, ICA)

Figure 6: Fish Landings. Colombia National Register

In the case of Gorgona PNN there is illegal artisanal fishing, as the Bazán community is authorized to transit through the marine protected area because they fish in two areas near the Park. This fishing community can be characterized as follows:

Gorgona	
Estimated population	40 – 58 (there is no fisher register)
Estimated number of vessels	15 – 22 registered at the port of Buenaventura
Gear used	Trammel nets, longlines and traps
Target species	Shark (dogfish and hammerheads), groupers, turtles, balloonfish
Fisher organizations/cooperatives	Since 2004 only one cooperative – Pescactiva – it has more or less 25 fishers
Main ports	Guapi and Buenaventura

Table 19: Gorgona fishing community

In the case of Malpelo SFF, as it is an island area with a huge biological and tourist value, it is impacted by a different set of activities:

Malpelo			
Type of fishery and/or activity	Vessel type utlized	Approximate crew size	Approximate time of fishing
Free diving	Pangas from 12-30 feet Outboard motors : 25-40 HP Speed: 6-8 knots	3 persons	7 am – 1 pm
Diving with tanks or compressor	Pangas from 12-30 feet Outboard motors: 25-40 HP Speed: 6-8 knots	3-5 persons	7 am – 1 pm 5 pm – 10 pm
Sports fishing	Yachts from 50-70 feet Speed: 15-30 knots	4-6 persons	7 am – 4 pm 7am – 1 pm
Camaroneros, Atuneros, Pesca Blanca	Fishing boats Speed: 8 knots	6- 20 persons	24 horas
Line fishing	Pangas from 12 to 20 feet Outoboard motors 25 HP Speed: 6-8 knots	4-5 persons	8 am – 3 pm
Longliners surface deployment or up to 10 fathoms Use currents to fish	Vessels between 32-40 feet Speed: 8-10 knots	5 persons	Gear is set at 3 – 4 pm Gear is drawn in at 10 pm
Trammel nets	Pangas from 12-30 feet Outboard motors: 25-40 HP Speed: 6-8 knots	3 persons	Gear is set at 5pm Gear is drawn in at 5 am: 12 horas

Table 20: Illegal Activities detected at Malpelo MPA
Source: Enforcement Handbook for Colombian authorities in the Malpelo Fauna and Flora Sanctuary, 2006

Analysis of Context / Governance:

There are a range of legal dispositions in Colombia which are applicable to marine protected areas. These involve several state entities directly, and several NGOs and local communities indirectly. The highest environmental authority is the Ministry of Environment, Housing and Territorial Development (MAVDT), which creates policies on the environment and biodiversity. The marine protected areas of Gorgona PNN and Malpelo SFF are managed directly by the Special Administration Unit of National Natural Parks (UAESPNN), which is a branch of the MAVDT. These marine protected areas do not have a complete administrative autonomy per se. However, it is important to note that the National Natural Parks Directorate operates out of territorial offices under the coordination of the UAESPNN, and in the case of the marine protected areas of the Pacific, are under the direction of the Southwest Territorial Office, which has its headquarters in Cali. The marine protected areas respond to legal environmental frameworks, but in terms of enforcement, authority is passed to the National Navy. The Territorial Office in Cali approves all logistical issues.

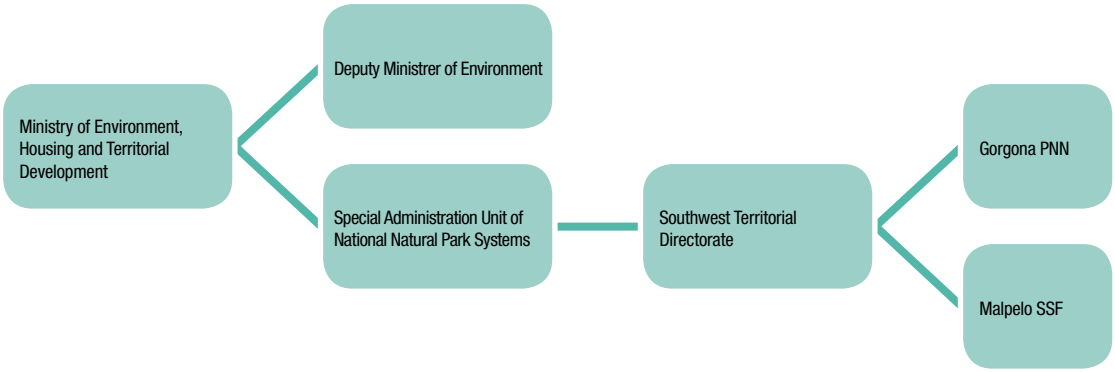


Figure 7: Structure of the Ministry of Environment, Housing and Territorial Development

There are certain institutional inconsistencies in the issue of fishing authorities. The Colombian Institute for Rural Development (INCODER) was the fisheries authority in the country for several years. In 2007, the Law for Rural Development was passed and this function was handed over to the Colombian Agriculture & Livestock Institute (ICA), under which was created the Fisheries and Aquaculture Section. However, last year this resolution was declared unenforceable by the Constitutional Court, resulting in the immediate devolution of powers to INCODER. Throughout 2009, ICA has retained its functions, through interinstitutional agreements between the two entities. There is therefore a significant institutional instability which has resulted in negative impacts on the development of the fishing industry as well as scientific research, closed seasons, minimum landing sizes, target species, quotas and the enforcement of sovereignty over the marine resources in the Colombian EEZ. In this context, the management of quotas, species, fishing areas and sanctions have all fallen under the influence of the large fishery interests.

With respect to sanctions and the management of confiscated products or gear from illegal fishing, there is a conflict of authorities between National Parks and INCODER, because both are empowered to impose sanctions for the same violations regarding illegal fishing in the MPA. National Parks does not have the logistical capacity to manage cargos of confiscated fish, so this should be assumed by INCODER, who also has the responsibility of auctioning confiscated products. National Parks does not have the authority to seize fishing gear or vessels – this must be carried out by the Navy, who generally do not like to do so, due to the high costs of maintaining a vessel at the Malaga Naval Base, where vessels are usually held.

In terms of administrative sanctions, there is a corresponding legal framework (Decree 216, [2003] – Administrative Restructuring of the Ministry of Environment), which establishes the composition of judges and legislators for preliminary hearing and higher courts:

- Local: PNN or SFF Administration
- Regional: Southwest Territorial Directorate (DT, Cali Offices, Valle del Cauca)
- National: General Director (Offices in Bogotá, D.C.)

Each level performs as a complementary administrative instance. In penal cases the Central Level is the second instance when the DT is the first instance. The DT imposes sanctions at the second instance (appeals) when the area or local program becomes the first instance. It is evident that the decentralization of the administration is not working in practice, because the capacity and responsibility over confiscated materials have not been delegated to the environmental authority.

Stakeholders

Public Sector Stakeholders

Name of Institution (Public Entity)	Role in MPA	Role of Civil Servant
Ministry of Environment, Housing and Territorial Development	Environmental Authority	Director of Ecosystems
National Natural Parks – Northwest Region	Administration and Management	Head of Gorgona
National Natural Parks – Northwest Region	Administration and Management	Head of Malpelo
National Navy – Marine General Directorate	Surveillance and control	Commander ARC Sula
DIMAR/IMO	Port captains	Port Captain
Ministry of Foreign Affairs	Sovereignty of interior waters	Environmental Affairs
Ministry of Defence	Surveillance and control	Defense Minister, Navy Commander, Coastguard Commander
Colombian Commission for the Ocean	Advisor to the National Government	Director

Table 21: Public Sector Stakeholders, Malpelo and Gorgona

Private Sector Stakeholders

Stakeholder	Type of Stakeholder: Public, Private, Community, NGO, other	Type of Attitude or Commitment to the Management of the MPA
Andi- Acodiarpe, Buenaventura Fishing Group	Group of private fishing businesses	Organization of boat owners. Against the MPA
Industrial Fishing Sector	Private	Are not aligned with the conservation of the MPA
Tour Operators	Private	Supports MPA
Pescativa, artisanal fishers	Community	Supports MPA
Bahía Cupica	Community	Supports MPA
Fundación Malpelo	NGO	Collaborates actively with MPA
Conservation International	NGO	Collaborates actively with MPA

Table 22: Private Sector stakeholders, Malpelo and Gorgona

2010 Budget	SFF Malpelo	PNN Gorgona
Capital Investment	US$50,000	US$178,000
Opperations	US$70,000	US$150,000
External Cooperations (estimated)	US$500,000	US$200,000
TOTAL	**$620,000**	**US$528,000**

Table 23: Budget for Malpelo and Gorgona

Surveillance and Detection

Malpelo: Personnel

In Malpelo SFF there is a manned National Navy post consisting of a lieutenant (occasionally), an officer and four marines who are rotated every month. The Navy supports the management of the area with eight crew members on board the *ARC Sula*. Logistical limitations prevent enforcement of the area reaching desirable levels of coverage and efficiency. There are insufficient personnel at National Parks. This situation is partially resolved with personnel from Fundación Malpelo (two workers who support the administration of the protected area) through a cooperative agreement between PNN and Fundación Malpelo, and with Navy personnel.

Fundación Malpelo has five biologists and two staff members who support the management of the MPA. There is a program for education, training, and equipment for marine Park Wardens. A program to manage marine and land based human resources has been developed. Monthly salaries range from US$1,350 and US$1,500 (COL $ 2,500,000 y 3,000,000).

Gorgona: Personnel

There are barely sufficient personnel if we sum the core staff (7) and personnel on fixed contracts (15). The latter depend on the existing cooperation projects in the area and from resources from the National Environment Fund (FONAM). The selection process contemplates the need for personnel with maritime experience. However, there is a lack of training and preparation in enforcement procedures. They are only able to dedicate 30% of their time to control and patrolling as the rest of the time they are implementing the area's management plan. As in Malpelo, marine enforcement falls under the jurisdiction of the Navy, with the vessels it uses to patrol the Pacific Ocean.

Education and Dissemination

Malpelo: In Malpelo SFF, the environmental education program is designed and implemented by Fundación Malpelo. The focus is oriented towards raising awareness through presentations and videos to different audiences, from local to international, and through scientific expeditions.

Gorgona: In the case of Gorgona PNN, within the environmental education plan, which is implemented directly by Park staff, a forum has been generated with stakeholders and visitors to socialize legal dispositions and regulations applied in the PNN.

Enforcement Vessels and Applied Technology

Malpelo: Since 2006, with the agreement signed between the Navy, Colombia National Natural Parks, Conservation International (Colombia) and Fundación Malpelo, the vessel *ARC Sula* is on permanent patrol. This vessel has autonomy of 4,000 nautical miles and a top speed of 18 knots. In addition to control and protection activities, it also carries out studies and scientific research activities. *ARC Sula* has radio and radar equipment, satellite phone, GPS, VHF, marine bandwidth UHF, video and photographic cameras. There is no night vision equipment. Coverage of the area is not 100% due to mechanical problems that arise on the vessel, and the lack of a backup. The availability is about 80%, but recently, technical failings and maintenance requirements have forced the boat out of service. There is a 1500-model Frigate, which has autonomy of 8,000 nautical miles at 14 knots, but it is not a cost-effective vessel for this type of operation.

Gorgona: The Park has two coastal vessels: one is 25 feet long with two 100 hp motors and a top speed of 27 knots, while the other is a water taxi 20 feet in length with two 40 hp outboard motors and a top speed of 16 knots. Maintenance is not effective, and at the time of this study, the water taxi was out of service. Both boats have GPS, VHF, UHF, a photographic camera and a compass. Neither boat has radar. Both have autonomy of about 8 to 10 hours. There is no night vision equipment. DIMAR sometimes assigns the vessels *ARC Isla Palma* and *ARC Gorgona* to the area, but their priority is weapons and drug smuggling. Over the next few months, the *ARC Calima* will begin permanent enforcement operations at Gorgona PNN.

Nearby settlements and multiple uses of the MPA

Gorgona PNN

- No settlements in the protected area but they arrive from nearby coastal areas on the continent.
- Bazán Island 35 km: at least 15 artisanalfishing boats, maximum 75 hp.
- Guapi 56 km: 2 tour boats.
- Buenaventura 150 Km.: around three supply vessels which leave Buenaventura pass through the protected area on a weekly basis. Industrial fishing vessels based out of Buenaventura are constant visitors to the protected area zone of influence and occasionally fish illegally in the protected area itself.
- There are no maritime trade routes and there are agreements with the fishers from Bazán to allow their transit through the area.

Malpelo SSF

- No nearby settlements.
- Buenaventura 490 Km: Colombia's Pacific industrial port with capacity to manage 20 million tonnes annually. Landing port for tuna and whitefish fleets.
- There are trade routes close to the Island: Supertankers and smaller ships.
- Resolution No. 0761 of 5 August 2002, included as a Particularly Sensitive Sea Area (IMO). Only passage of lesser vessels such as sailing boats, mostly en route Panama-Galapagos.

Organization and Enforcement Planning

SFF Malpelo: There is a daily plan for terrestrial sectors and a weekly plan for the marine zone that take into consideration: personnel organization, random patrols and intelligence activities. The maritime authority prepares and is responsible for enforcement operations. Exploration patterns are being developed and there are daily logs of enforcement activities. Collaboration with the Navy generates trustworthy sources of information, for example, some dive operators collaborate and inform the Navy directly (either land-based personnel or the ARC vessel that is in the area) if there are any incidents. Fishers inform the Navy when foreign vessels are detected in the sector.

The protection of the MPA is currently not greater than 50% of the total area when the *ARC Sula* is operating normally. However, it breaks down frequently and is not always replaced by another Navy unit. Industrial (tuna) and semi-industrial (whitefish) fisheries place constant pressure on Malpelo SFF, both directly by illegal fishing and indirectly through fishing at Dorsal Malpelo, the area of influence. Industrial and semi-industrial vessels have top speeds of 8 to 15 knots, and autonomies of 7 days to 2 months without resupplying. Enforcement is complicated due to the size of the MPA, the high costs of oceanic operations, the need for complementary measures, and the lack of modern vessels.

PNN Gorgona: There is little planning for either terrestrial or marine sectors, and planning is based on random searches rather than intelligence information. There are no exploration patterns, but there are written records. Besides collaboration with the Navy and the Bazán community, there is no access to information sources. In general, the enforcement program lacks adequate planning, does not have a solid information base, and essentially follows established routines. Patrol boats operate on average 140 days a year and patrols last from two to three hours translating into 280 patrol hours per year. Patrol reports are produced, which have been previously formatted and agreed upon with the other authorities. An application is currently being developed to relate thematic terrestrial and marine information with mapping. Navy vessels have no routine and are more focused on controlling smuggling in the area (narcotics and weapons). In some cases, fishers make complaints after the violations have

occurred and in many cases it is not possible to verify them. The Park has developed its relations with stakeholders willing to work collaboratively, such as the artisanal fisher group Pescactiva (Bazán Community, El Charco-Nariño). This process, initiated in 2000, has led to the realization of projects that contribute to the sustainable use of fisheries resources, conflict resolution for aquatic resources and the improvement of the standard of living of the fishers. The agreement implies a high level of collaboration in issues of research, monitoring, and control of aquatic resources in the protected area and its area of influence.

Around Gorgona, fishing vessels mostly have top speeds of 35 knots and autonomies of 100 to 150 miles (they often carry extra fuel tanks). As violators tend to be artisanal fishers, most vessels are wooden canoes with outboard motors and mother vessels with radar that support the fishing activities. The main problems arise from abandoned gear in the MPA, which are very harmful to the marine environment and generate perpetual conflicts with the communities.

Detection Probability

Malpelo SFF: Malpelo SFF has a surface area of 2,794.25 square nautical miles in the marine reserve zone and 3.5 km2 of terrestrial area. Enforcement is oceanic and the target vessel type is industrial or semi-industrial. Malpelo SFF is the ninth largest fully protected marine protected area in the world.

According to the equation defined at the beginning of this publication, detection probability should be estimated with the following site conditions and patrol strategy:

Sweep width: 8 to 16 nautical miles (X-width navigation radar for small and large vessel detection).

Distance covered: Variable between 120 and 450 nautical miles.

Area to explore: 2,794.25 nm^2 (9,584 km^2).

With these parameters, the detection probability is:

Malpelo SFF MPA

Maximum Effective Detection Distance nm

Distance Covered (nm) or Hours Patrolled nm/120

27.54%	6	8	10	12	14	16	18	20
120	22.72%	29.08%	34.91%	40.27%	45.19%	49.70%	53.84%	57.64%
150	27.54%	34.91%	41.54%	47.49%	52.84%	57.64%	61.95%	65.82%
180	32.06%	40.27%	47.49%	53.84%	59.42%	64.32%	68.64%	72.43%
210	36.30%	45.19%	52.84%	59.42%	65.08%	69.95%	74.15%	77.76%
240	40.27%	49.70%	57.64%	64.32%	69.95%	74.70%	78.69%	82.05%
270	44.00%	53.84%	61.95%	68.64%	74.15%	78.69%	82.44%	85.52%
300	47.49%	57.64%	65.82%	72.43%	77.76%	82.05%	85.52%	88.32%
330	50.77%	61.12%	69.30%	75.76%	80.86%	84.89%	88.07%	90.58%
360	53.84%	64.32%	72.43%	78.69%	83.53%	87.27%	90.16%	92.40%
390	56.72%	67.26%	75.23%	81.27%	85.83%	89.28%	91.89%	93.87%
420	59.42%	69.95%	77.76%	83.53%	87.81%	90.97%	93.32%	95.05%
450	61.95%	72.43%	80.02%	85.52%	89.51%	92.40%	94.49%	96.01%

Table 24: Detection Probability in Malpelo SFF.

Illegal Fishing in Malpelo

In September 2009, while the *ARC Sula* was out of service for maintenance, illegal fishing began again. The replacement Navy vessel, *ARC José María Palas*, seized 62 sharks and 118 shark fins. The Director of National Parks, Julia Miranda, declared in interviews that she had received a number of complaints about the presence of Costa Rican and Ecuadorian boats in the Malpelo marine area. The Chancellor's Office has sent an official letter of protest to these governments, demanding that they control their vessels

Ecuadorian tuna fishers in Malpelo

Four noteworthy cases include the Ecuadorian vessels *Katty Vetania, Gloria C., María José* and *Carolina*, which were intercepted while fishing illegally in Malpelo. In the first case, legal proceedings began on March 23, 2006 at the Buenaventura Port Authority, and sentence was passed on March 28, 2006 with a fine of $10,200, which was paid prior to the vessel leaving. The second case began on June 28, 2006 and a fine of $12,300 was imposed on July 1 2006, which was also paid before leaving port. The third hearing began on September 29, 2006 and a fine of $16,320 was imposed, which was paid and appealed. Another vessel fined in 2009 is the Carolina – court proceedings began on July 18, 2006 and sentence was passed on October 13, 2006, and the offenders have been notified of the fine amount of $6,150.

For the analysis, a minimum Detection Probability of 75% was established, which shows that extensive permanent presence in the area is required (around 210 hours), to reach acceptable numbers. If this is added to the time spent out of service due to maintenance, which in a best-case scenario leads to an availability of 80%, the detection probability is reduced to 60%. To compensate for this we recommend that an additional vessel with autonomy of at least 20 days and a top speed of 25 knots be obtained.

Gorgona PNN: Enforcement at Gorgona PNN is less complicated because the area is smaller (598.36 km^2) and there is a greater chance of obtaining backup nearby if required.

Although the smaller area makes detection easier, the main targets are small wooden or fiberglass artisanal vessels no larger than 10 meters. This type of boat has a maximum detection distance of six to ten miles, and is mainly detected visually because radar is not efficient for these sizes and materials. Additionally, Gorgona PNN does not have oceanic patrol vessels, but only smaller boats. This limitation affects the sweep width and keeps it below 10 nm.

With these parameters, the detection probability is:

Sweep width: 6 to 10 nautical miles (X-width navigation radar for small and large vessel detection).

Distance covered: Variable between 30 and 140 nautical miles.

Area to explore: 174.45 nm^2 (598.36 km^2).

PNN Gorgona

Distance Covered (nm) or Hours Patrolled nm/120 \ Maximum Effective Detection Distance nm	99.43%	6	8	10	12	14	16	18	20
30		64.36%	74.74%	82.09%	87.30%	91.00%	93.62%	95.47%	96.79%
40		74.74%	84.03%	89.90%	93.62%	95.96%	97.45%	98.39%	98.98%
50		82.09%	89.90%	94.31%	96.79%	98.19%	98.98%	99.43%	99.68%
60		87.30%	93.62%	96.79%	98.39%	99.19%	99.59%	99.80%	99.90%
70		91.00%	95.96%	98.19%	99.19%	99.64%	99.84%	99.93%	99.97%
80		93.62%	97.45%	98.98%	99.59%	99.84%	99.93%	99.97%	99.99%
90		95.47%	98.39%	99.43%	99.80%	99.93%	99.97%	99.99%	100.00%
100		96.79%	98.98%	99.68%	99.90%	99.97%	99.99%	100.00%	100.00%
110		97.73%	99.36%	99.82%	99.95%	99.99%	100.00%	100.00%	100.00%
120		98.39%	99.59%	99.90%	99.97%	99.99%	100.00%	100.00%	100.00%
130		98.86%	99.74%	99.94%	99.99%	100.00%	100.00%	100.00%	100.00%
140		99.19%	99.84%	99.97%	99.99%	100.00%	100.00%	100.00%	100.00%

Table 25: . Detection Probability in Gorgona PNN.

What the table above shows is that patrolling within Gorgona PNN is very effective even when smaller vessels are used. Given that maintenance time must be considered, the ideal situation would require two vessels with full crews.

Patrols should not last less than 5 hours, and with a stationary position not greater than 10 hours, there is a detection probability close to 100%. To ensure these numbers during night patrols, infrared and nocturnal vision equipment are required to obtain a sweep width of 10 nautical miles. This calculation shows that at least one small vessel with a crew of at least three Park Wardens is required. Patrol vessels should be at least 10 meters long, top speed of 25 knots, 12-hour autonomy (with additional fuel tanks), marine VHF radio, GPS, night vision equipment and fixed onboard radar.

Electronic Monitoring Systems for Vessels

In Colombia, DIMER has implemented a satellite monitoring system (VMS) and fishing vessels are monitored directly from Bogota. However, the resulting information is only used to protect life at sea, i.e. exclusively for safety issues. VMS are multi-purpose devices that generate information about vessel location and routes. Agreements need to be drawn up in Colombia to permit the use of this information by different maritime authorities and MPAs. Monitoring systems should also be implemented on other vessel types (tourism, transport) which use MPA waters and are currently not controlled in any way. There are no other means of electronic surveillance such as radar or AIS (Automatic Identification Systems).

Interception and Arrest

Malpelo: There is a Protocol for boarding vessels and crime scene investigation. There is a continuous training program that involves the Navy, DIMAR, the Attorney General, INCODER and National Natural Parks. There is a template for the collection of basic information on the offender, samples of the plant, animal and aquatic resource material and other species, along with products, elements, equipment, vehicles and methods used to commit the environmental offence.

There are procedures for the collection of evidence, but these are not always followed properly. For example, the condition of the nets on the vessel is often not reported, so it is difficult to determine whether the catch came from the MPA or a nearby area. In general, basic information is collected, but evidence is not collected in the correct manner, which limits both the penal and the civil legal processes. The Navy and National Natural Parks personnel responsible for collecting evidence are being trained but personnel rotation or the replacement of the *ARC Sula* are factors which affect investigations and the resulting legal processes. Reports are handed in on time, some are even done while still at sea. There is a 36 hour period for Habeas Corpus, which implies a need to develop an effective procedure in terms of information and the capacity to involve other administrative authorities such as the Attorney General, because if the reports are not properly prepared, charges may be dropped.

There is a manual for environmental sanctions (Law 1333 of 2009), and the Environmental Authority, in this case National Natural Parks, reports basic statistics. In penal cases, these are transferred to the Attorney General and in administrative cases, INCODER is the corresponding authority.

Gorgona: There are no boarding procedures in Gorgona PNN. For this type of investigation, Law 1333 (2009) applies, which sets out the environmental sanctioning procedure and dictates other dispositions. In general, when the offender is caught red-handed, an official report is prepared which states the motives for the arrest, the authority making the arrest, the place, date and time, person responsible, and person, project, work or activity to which the preventative measure was applied. The document is signed by the offender or, in case of refusal, a witness, or if there are no witnesses, the officer in charge. The document is made official by an administrative act, where the conditions of the preventative measures are established over a three-day period.

There is a template for the collection of basic information on the offender, samples of the plant, animal and aquatic resource material and other species, along with products, elements, equipment, vehicles and methods used to commit the environmental offence. In general this is not applied to artisanal fishing or fishing gear abandonment that occurs in Gorgona. If necessary, it is possible to order the examination of evidence in accordance with the principles of propriety, pertinence and necessity. In Gorgona PNN reports are required to be produced immediately because the offences, being artisanal fishing or gear abandonment, are committed in flagrante.

Prosecutions, Sanctions and Sentencing

There is a manual for environmental sanctions (Law 1333 of 2009), and basic statistics are reported by the Environmental Authority, in this case National Natural Parks and Fauna and Flora Sanctuaries. Environmental offences are remitted to the Directors who act as a first legal instance and try to resolve the cases as quickly as possible.

The crew and vessels which may have committed an offence or crime, along with the catch found on board and the fishing or dive gear are confiscated and placed under the case of the responsible authorities in the time frame stipulated by the law, once the vessel arrives in port.

Material	Authority
Ship or fishing vessel	Buenaventura Port Authority
Fishing	INCODER
Weapons	District Attorney
Fishing and dive gear	INCODER
National Crew	District Attorney
International crew	District Attorney – DAS
Minors/Underage	District Attorney – Family Welfare
Narcotics, flammables	District Attorney

Table 26: Disposal of confiscated materials

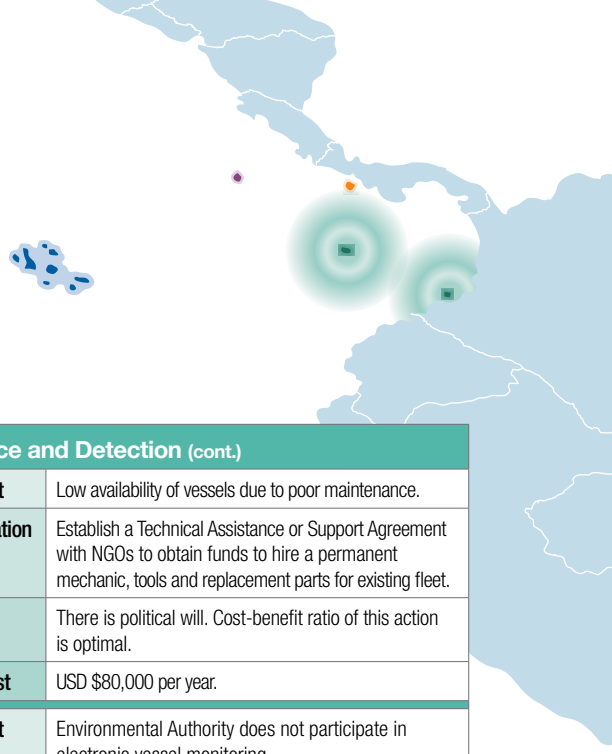
In general there are three types of violations in MPAs, two of which are administrative offences:

1. To fish illegally in a PNN and SFF MPA system is an environmental violation and an administrative offence. In this case the sanction is the confiscation of the catch and gear (vessels and nets or lines) or fines of up to 5,000 minimum salaries (US$750,000). Equipment and catch are mostly handed over to INCODER, and the proceeds from fines cover the legal payment system, which is complex, costly and of little benefit to environmental restoration.
2. A second administrative violation in the form of illegal fishing in a closed area is dealt with by INCODER and implies sanctions such as the permanent confiscation of the products and equipment (vessels and fishing gear), cancellation of fishing permits and monetary fines. The sanction imposed is the confiscation of the gear and products, which are auctioned by INCODER who incorporates the proceeds into its budget.
3. A third penal offence is presented to the Office of the Attorney and may imply sanctions similar to the above, but may also results in detention. These are generally not prison offences, but if the offender is recurring, the maximum penalty may be applied (up to three years prison sentence).

Process	
Factor under Observation	Speed and efficiency of Administrative Processes.
Criteria	Verify length of time from start to completion of administrative processes. Estimate average time (take around five cases).
Gorgona	Gear abandonment: 1 month, does not involve any people. Artisanal fishing: 4 to 5 months, involves one or more people. In general the processes are fast because once the preventative confiscation has occurred, there is no contact with the offender or there is no offender because the gear has been abandoned.
Malpelo	One year, the offender often has a defense lawyer who uses technicalities to appeal and plea for reversal.
Factor under Observation	Speed and efficiency of Judicial Processes.
Criteria	Verify time from start to finish of administrative processes. Calculate average time (at least 5 cases).
Gorgona	There have been no judicial processes.
Malpelo	1) Formulation and charges (District Attorney): immediate. 2) Trial (Judicial Authority): relative 3 months to 2 years, depending on evidence solicited and appeals.
Factor under Observation	Proportion of unresolved cases.
Criteria	Proportion of all the cases over the last five years which have not been resolved.
Gorgona	100% of cases have been resolved. Statistics refer to recent years, especially cases in 2009.
Malpelo	100% of cases have been resolved.
Factor under Observation	Proportion of cases presented which are accepted.
Criteria	Ideally 100%.
Gorgona	All administrative cases have been accepted.
Malpelo	100% of cases presented have been admitted because the offenders were all caught in the act (industrial fishing and abandonment of fishing gear), which are clear environmental offences.
Factor under Observation	Case follow up.
Criteria	Is there a mechanism that permits the environmental authority or the MPA to participate in judicial cases?
Gorgona	There have been no judicial processes, but the environmental authority becomes the affected party in the judicial process.
Malpelo	By Law, the environmental authority becomes the affected party in the judicial process.

Sanctions and Sentencing	
Factor under Observation	Proportion of processes initiated versus sentences.
Criteria	If proportion is low, determine the reasons why: inadequate procedures? Bad management of evidence? Abandonment of case? Prescription? Pressure on justice system?
Gorgona	High efficiency (82%).
Malpelo	Efficiency is very low due to the distances between the protected area and the closest port. Initially it was not possible to comply with the 36-hour limit required by law to present the official report. There are problems with evidence collection, and the detained are usually industrial fishers who place appeals.
Factor under Observation	Processing time.
Criteria	Take at least 5 cases and average their length.
Gorgona	Average of 4 months from start of investigation to sentencing.
Malpelo	From 18 to 24 months for cases in 2008 and 2009.
Factor under Observation	Sentences carried out.
Criteria	Verify whether sentences were carried out (proportion).
Gorgona	Of the 14 cases resolves, only three had effective sanctions – confiscation of fishing gear. The rest of the cases were shelved.
Malpelo	In both cases the sanction went to debt collection to make it effective.

Table 27: Evaluation of Administrative or Penal Processes



Recommendations

Malpelo Fauna and Flora Sanctuary and Gorgona National Natural Park, Colombia

Surveillance and Detection	
Critical Aspect	Lack of vessels in both MPAs: oceanic boat in Malpelo and two boats for Gorgona.
Recommendation	1) Add an oceanic vessel with 20 days autonomy and top speed of 25 knots to Malpelo patrol team. Include radar, GPS, night vision equipment, HF radio and marine VHF radio. 2) Add a fiberglass boat, 10 m length, 25 knots top speed and 12 hour autonomy to Gorgona.
Feasibility	Medium. Should be arranged with Colombian government and potential donors.
Estimated Cost	1) US$850,000. 2) US$100,000.
Critical Aspect	Constant rotation of Navy personnel.
Recommendation	Implement a permanent training program for environmental issues and legal processes for violators.
Feasibility	Viable but requires advocacy.
Estimated Cost	$25,000 per year.
Critical Aspect	Park Warden salaries are not competitive.
Recommendation	1) Increase budget for Park Wardens. 2) Consider per diem payments (for work at sea or in remote locations).
Feasibility	1) There is will but no funds. 2) Per diem budget could be increased.
Estimated Cost	1) Cost assumed by the Colombian Government. 2) US$50,000 per year. Cost assumed by Colombian Government or by NGOs for a period of time.
Critical Aspect	Personnel limitations.
Recommendation	1) Assign qualified personnel to Gorgona PNN and Malpelo SFF on a permanent basis. Two professionals and three Park Wardens in Gorgona. 2) Departments of Public Works (Treasury Department) must increase the number of professional and technical job positions in National Natural Parks staff.
Feasibility	1) Medium. Requires lobbying and pressure. 2) Political will in the face of a clear and justified need. Direct budget assignment.
Estimated Cost	US$60,000 per year. Can be assumed by Colombian Government.

Surveillance and Detection (cont.)	
Critical Aspect	Low availability of vessels due to poor maintenance.
Recommendation	Establish a Technical Assistance or Support Agreement with NGOs to obtain funds to hire a permanent mechanic, tools and replacement parts for existing fleet.
Feasibility	There is political will. Cost-benefit ratio of this action is optimal.
Estimated Cost	USD $80,000 per year.
Critical Aspect	Environmental Authority does not participate in electronic vessel monitoring.
Recommendation	Agree access to electronic monitoring data with Maritime Authority.
Feasibility	Low. This agreement should be pursued but there are conflicts of jurisdiction between institutions and interests from sectors that do not wish to be controlled.
Estimated Cost	US$225,000 in equipment and training to create a parallel Monitoring Center in case the Maritime Authority does not approve shared use of its resources.
Critical Aspect	Enforcement of the protected area is under the jurisdiction of the Navy. There is collaboration with state authorities but the Navy sets priorities for operations and these rarely benefit MPA management.
Recommendation	1) Improve planning of operations, especially in Gorgona. 2) Add new vessels to both MPAs. 3) Carry out annual planning workshops with top ranking authorities.
Feasibility	Political will to link technical personnel specialized in environmental issues to strengthen enforcement groups in marine and coastal areas.
Estimated Cost	1) None. 2) Included above. 3) $25,000 per year.

Interception and Arrest	
Critical Aspect	Lack of training of Park Wardens.
Recommendation	Fully integrated Park Warden training, following international course guidelines and recommendations and the exercise of their activities at sea. Special attention should be given to boarding protocols and crime scene investigation.
Feasibility	High. The Environmental Authority must be involved to establish this on a permanent basis.
Estimated Cost	US$45,000. Costs depend on courses, visits, seminars according to market price or arrangements made by NGOs or Colombian Government.
Critical Aspect	No census of vessels which use the MPA.
Recommendation	Carry out census of vessels to regulate their entry to Gorgona.
Feasibility	High.
Estimated Cost	US$20,000.
Critical Aspect	Officials, Park Wardens and Attorneys do not fully understand the regulatory framework.
Recommendation	Carry out workshops and forums that keep the different authorities in the marine and coastal area up to date with the regulatory framework and with the protocols and templates required for administrative and judicial processes. The judges and attorneys who are involved in these cases should also participate, because in some cases their lack of knowledge has led them to ignore the impact created by the offenders.
Feasibility	Medium.
Estimated Cost	$45,000 per year.
Critical Aspect	Lack of capacity to monitor cases taken up by INCODER and District Attorney.
Recommendation	1) Assign lawyers to assist monitoring penal and fishing cases, and enlist the support of educational institutions (universities). 2) Explore possibility for NGOs to monitor cases or act as plaintiffs.
Feasibility	High, especially in cooperation agreements with Universities with law Schools (internships).
Estimated Cost	US$60,000 per year.

Critical Aspect	Sanctions do not reflect the damage caused to the resource and costs of reparation.
Recommendation	Modify regulations to allow the Environmental Authority to seize illegal catches, and include the cost of resource recovery in the sanctions imposed.
Feasibility	Low. The current regulatory framework must be modified; this will affect several interest groups.
Estimated Cost	US$30,000.
Critical Aspect	Impunity: Slow processes and loss of cases.
Recommendation	1) Develop a legal assistance program that permits prosecution of cases as support to the administrative authority or as public or private plaintiff. 2) Promote administrative sanctions that can be imposed by the MPA Director.
Feasibility	Medium. The Environmental Authority is interested, implementation would be simple, and the results immediate. However, the action would generate a response from the affected parties and a political reaction can be expected.
Estimated Cost	1) US $30,000 per year for a lawyer. 2) US$15,000.

Galapagos Islands
Ecuador

Background

The Galapagos Marine Reserve (GMR) is one of the largest marine reserves in the world. It covers an area of ocean of more than 133,000 km2, around the islands, which make up the Galapagos Archipelago. The GMR extends 40 nautical miles from a baseline, which joins the furthest points around the major islands. The GMR was formally created in March 1998 by the proclamation of the Special Law for the Sustainable Development and Conservation of the Province of Galapagos (LOREG). Twelve years later it is clear that important advances have been made in terms of fleet size, infrastructure, human resources and institutional development. However, the management of marine resources is still a complicated matter, especially due to the constant pressure placed on resources and the need for technical and human coordination in the maintenance of the patrol fleet.

Socioeconomic Value

The Artisanal Fishing Sector

Initially, economic activities in Galapagos were based mainly on fishing. This situation remained unchanged from the beginning of the 20th century until the start of the 1970s. The main target species in Galapagos are the lobster, sea cucumber, tuna, and several species of whitefish (Galapagos grouper “bacalao”, wahoo, snapper, dolphinfish etc). These are all species of high unit value (lobster US$10 per pound, dried sea cucumber US$5 per pound). There is no formal sustained market chain. The Galapagos fishing fleet is mainly artisanal and made up of fiberglass vessels (less than 7.5 m length), and boats (larger vessels up to 20-25 Tonnes). Fishing activity peaked at the end of the 1990s with the sea cucumber boom, but the progressive decline of the resource has reduced the fleet. Currently, there are 446 fishing vessels registered in the GMR but they continue to be retired from fishing due to their condition, resource depletion or because the owner changes activity. At present only 335 vessels are active, of which 48 are categorized as “botes” that is, vessels with a greater capacity.

Active Artisanal Fishing Vessels				
Type of Vessel	San Cristóbal	Santa Cruz	Isabela	**TOTAL**
Boats	27	16	5	**48**
Fiberglass	71	63	78	**212**
Pangas	65	11	19	**95**
TOTAL	**163**	**90**	**102**	**355**

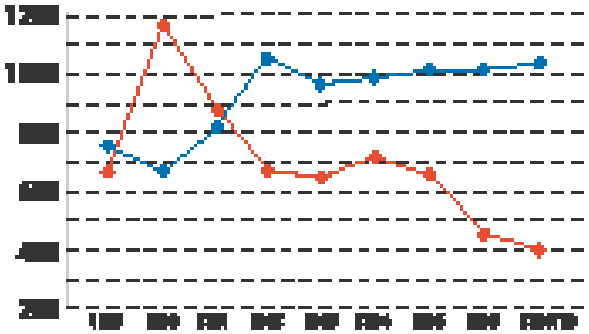
Table 28: Registered Fishing vessels in the GMR
Source: GNP records

At its peak, fishing generated between 1,000 and 2,000 jobs, but monitoring records over the last three years show a significant reduction in this number (currently about 365 to 400 active fishers). This is due mainly to changes in economic activity as people opt for other opportunities, especially tourism, either as employees or as small private businesses linked to tourism, but also to the increasing costs of operation and the depletion of fishery resources. The evolution of the fishing sector has been irregular but marked by a declining trend in income.

Registered and Active Lobster Fishers in the Galapagos Marine Reserve

Year	Registered Fishers	Active Fishers
1999	752	682
2000	682	1,183
2001	834	879
2002	1,059	677
2003	978	645
2004	997	703
2005	1,001	659
2006	1,007	450
2006	1,023	400

Table 29: Fishers in the Galapagos Marine Reserve over time
Source: Galapagos National Park Administration



This sector has been greatly influenced by mafias and members of illegal smuggling rings, because the GMR has easily harvestable high value marine resources. A set of dried shark fins can fetch between US$60 and US$100 (this is from one individual shark, and depending on the size of its fins), and sharks are abundant in the GMR. Quick, lucrative money can be made if a local fisher can catch, on average, between three and five sharks over a two-day period. This translates into a negative situation for conservation and management.

The Industrial and Semi-industrial Fishing Sector

The GMR is located in a highly valuable geographic sector from the point of view of industrial fishing, due to the abundance of migratory resources such as tuna and whitefish. Ecuador possesses the largest tuna fleet in the South Pacific, and there are also important fleets in Colombia, Panama and Mexico, while international Asian fleets are based out of private ports in Costa Rica. Most tuna boat owners are multinationals and are members of the ITATTC. This tuna fleet is highly specialized and its vessels have a high level of autonomy, therefore the Galapagos Special Law prohibits its entry into the marine reserve, along with other mechanized fishing vessels with high efficiency and technology.

Another group of vessels, which threatens the GMR, are the semi-industrial fishing vessels (20 to 50 gross tons). These vessels come from Costa Rica, Colombia and Ecuador and operate in conjunction with various fiberglass boats (pangas), which they either tow or meet up with from local ports in the GMR. These small boats are very difficult to detect from GNP or coastguard patrol vessels and enter into the marine reserve to fish. Given the size of the GMR, there are often requests for “innocent passage” by tuna vessels en route elsewhere, but these innocent passages are being used to set fish aggregating devices (FADs) which makes fishing more efficient.

The Tourism Sector

The first organized tourism activities began from 1966 to 1972, and then grew and became internationally renowned from 1980-85, registering annual growth rates of 8% to 15%, so that the total estimated number of tourists arriving in Galapagos in 2009 was 180,000. Current projection rates suggest that in four years Galapagos will be reaching 300,000 tourists each year unless steps are taken to reduce this growth rate.

Number of Tourists

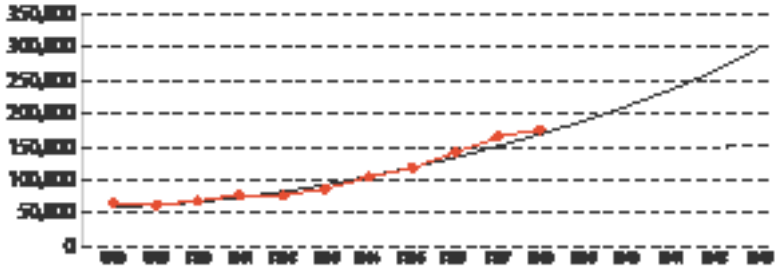


Figure 8: Tourist visits to the GNP. Trends.
Source: GNP records

Direct income from cruise based tourism from 1991 to 2006 (that is, the tour fleet and travel agencies) grew at an impressive rate of 725% from an initial value of US$19.7 million (Epler ,1993) to US$145.5 million (Epler , 2007). Travel agencies accounted for US$25 million, of which US$20 million went to international agencies and US$5 million to local agencies or counterparts. Cruise tourism, according to the same study, reflected an average annual growth rate of 14% for the period 1991–2006, from which the report concludes that:

- Tourism drives the local economy.
- The relationship between income and population size shows a clear effect on the local economy (shown by the high cost of living and inflation).
- The tourism industry is a magnet for labor and businesses for the local population, and in effect, is the cause of the reduction of the fishing fleet and of migration to the islands.

The Galapagos tourism fleet (in 2009) consists of 84 vessels, all of which are active and licensed to carry out their activities within the GMR.

Tour Vessels Registered with GNP			
State		Tonnage	
Inactive	Active	< 20 TRB	> 20 TRB
0	84	1	83
0	84	1	83

Table 30: Tour vessels operating in Galapagos, 2009

The Galapagos National Park (GNP) is about to distribute more than 70 new tour operator licenses for a similar number of vessels for different modes of operation. This decision will accelerate the growth of the number of tourists visiting the islands, so we are certain that if the current control schemes are maintained, the problems will be exacerbated. In addition, local based tourism grew from US$1.2 million in 1991 (Epler, 1993) to approximately US$10.7 million in 2006 (Epler, 2007); an average annual growth rate of 14%. Santa Cruz accounted for 91.6% of this income, and accounts for 83% of the activity.

Hotels	$1.1	$10.73
Cruise boats	$19.6	$120.50
On-island expenses	NA	$12.04
TOTAL	**$20.7**	**$143.27**

Table 31 : Amount and distribution of expenses incurred by tourists in Galapagos, 1991 vs 2006

Other Activities in the GMR

The growth of tourism has led to a surge of new activities and an increase in existing marine activities such as the transport of tourists between ports (13 vessels), cargo transport (seven vessels), fuel transport (two vessels) and site tourism vessels (daily tours to visitor sites but which are categorized as "transport"). These activities are either unregulated or insufficiently regulated, resulting in risks to the management of the GMR.

Analysis of Context/Governance

Marine environmental legislation in Ecuador is dispersed and lacks specificity. There is no single national legal body that establishes universal activity and marine management regulations and sanctions.

The Galapagos Special Law (LOREG) is the most complete set of regulations as it defines violations and crimes, and establishes sanctions specifically for fishing and tourism activities, but it is limited to the GMR. Unfortunately, it later became evident that other activities such as passenger transport, cargo transport, fuel transport and submarine activities were never regulated, so the Law became outdated soon after its implementation. Another incomplete aspect of the LOREG was that it provided exclusive mechanisms and privileges to the local population with regard to access to natural resources, but did not establish the obligations and definitions in the case of local citizens not abiding by the law, especially in recurring cases. Having said this, an important aspect of the LOREG is the authority granted the Director of the Galapagos National Park as a first instance judge. This implied a fundamental progress in the matter of sanctions and permitted most violations to be addressed on a local level, within the administrative regime, leaving criminal offences to the courts. Given the importance of the marine reserve, the GNP has the same authority as a Subsecretary under the Minister of Environment; both can facilitate the preparation of proposals for Regulations, or changes to these (which need to be approved by the Presidency of the Republic), as well as the proclamation of Resolutions of immediate application within its area of jurisdiction as an operational complement to the legal framework.

Education and Dissemination

The GNP has an extensive permanent Education and Dissemination program and has also created alliances with public and private institutions for the correct execution of these tasks. The GNP relies on the permanent support of the following partners: Charles Darwin Foundation, Provincial Board of Education, Conservation International (NGO) and FUNDAR (NGO). Despite these efforts, the academic level of the formal education system in the Galapagos Province is one of the lowest in the country. This is ironic if one considers that, without doubt, it is the province with the highest per capita income and employment rates.

Inter-Institutional Relations and Conflicts between Guilds and Institutions

The creation of the GMR is a relatively recent event (1998). Once the LOREG went into effect, there were an infinite number of conflicts between national and local institutions, which were correcting and defining the assignment of responsibilities, jurisdiction and funds generated from the visitor entry fee. Additionally, the sustained growth of tourism resulted in an unexpected and permanent increase in funds. This, in turn, politicized the Park Director position due to disputes regarding the allocation and control of all this new income. As in all scenarios, the main inter-institutional conflicts arose from overlapping powers (Navy-GNP, Municipalities-GNP, Prefecture-Municipalities, etc) and levels of access to decision-making powers, access to economic resources and political interests.

Administrative Decentralization

Although the LOREG decentralized the GNP, recent changes in the structure and administration of the State have centralized control once more. This centralization has given the State control of funds, but at the expense of making the GNP more bureaucratic. There is also the possibility that the State might use those funds for other ends.

Stakeholders

Public Stakeholders

Name of Institution (Public Entity)	Role in MPA	Role of Civil Servant
Ministry of Environment	Maximum political and environmental regulatory authority.	Minister.
Galapagos National Park Service	MPA Administrator.	Director.
National Administration of Aquatic Spaces	Maritime Authority. Safety of life at sea, vessel and crew registration, marine traffic control.	Director
Insular Administration of the Merchant Marine	Same as above but with delegated authority locally for Galapagos.	Director
Coastguard	Maritime police. Marine surveillance and control.	Commander
Ministry of Tourism	Maximum political and national regulatory authority for tourism activities.	Minister
Galapagos National Institute (INGALA)	Maximum authority for planning and migratory control in the province.	Director
Port Authorities	Local delegate of the Maritime Authority. Authorizes port entry and exit and qualifications of marine personnel.	Port Captain
Ministry of Agriculture, SESA-SICGAL	Control of species introduction and eradication.	Director
Environmental Police	Prevention, Control and application of the Law with regard to environmental offences in urban areas, ports and airports.	Commander UPMA
Municipality of San Cristobal	Administration of the district urban zone.	Political Stakeholder. Joint management for access to economic resources. MPA is not a priority.
Municipality of Santa Cruz	Administration of the district urban zone.	Political Stakeholder. Joint management for access to economic resources. MPA is not a priority.
Municipality of Isabela	Administration of the district urban zone.	Political Stakeholder. Joint management for access to economic resources. MPA is not a priority.
Provincial Prefecture	Manages public works in the Province. Will be eliminated in the short term.	Provincial Political Stakeholder. Overlapping management with Municipalities but joint actions to access economic resources .
Provincial Board of Education	Responsible for the provincial education policy.	Education. Very weak institution. Academic level of graduating students does not show progress.
Provincial Board of Agriculture	Public Stakeholder. Responsible for the provincial agriculture policy.	Agriculture. Weak functional and economic situation.
Provincial Board of Tourism	Public Actor. Responsible for the provincial health policy.	Tourism. Weak functional and economic situation.
Provincial Board of Health	Public Actor. Responsible for the provincial health policy.	Public health. Weak functional and economic situation.

Table 32: Public Sector Actors

Private Sector Stakeholders and Non-Government Organizations

Stakeholder	Type of stakeholder: Public, Private, Community, NGO, other	Type of attitude or commitment to the management of the MPA
ASOGAL. Association of Galapagos Tour Operators.	Private	Group of large and international tour operators. Usually have political power and lobbying capacity. Situational support of the GMR.
CAPTURGAL. Galapagos Provincial Chamber of Tourism	Private	Local tour operator guild. Less economic capacity. Committed to the GMR but challenge regulations because they find it complicated to comply with environmental standards.
Charles Darwin Research Station	NGO	Supports the GMR in terms of scientific research, education, management, dissemination, participatory management etc.
World Wildlife Fund	NGO	Supports GMR enforcement, fisheries management, waste recycling, species introduction etc.
Conservation International	NGO	Supports GMR enforcement, scientific research, eradication and control of species.
Spanish International Cooperation Agency	NGO	Supports GMR in issues of governance, institutional strengthing and socio-economic projects.
Sea Shepherd	NGO	Supports GMR enforcement.
WildAid	NGO	Supports GMR enforcement and trafficking of protected species.
FUNDAR	NGO	Supports GMR in socio-economic and governance issues.
University of Guayaquil	Private, University	Supports GMR management and marine research.
University of San Francisco - GAIAS	Private, University	Supports GMR management and marine research.

Table 33: Private Sector Actors

Surveillance and Detection

Personnel

The current GNP fleet requires a crew of 79 people. With the application of advanced surveillance technology (VMS-AIS) this could be reduced by 10-15 people. In the following analysis we will use current figures for the entire fleet. The Government has only authorized 38 of these positions, so there is a deficit of 41 crew members, as shown in the following table:

Personnel	Required (minimum)	Backup personnel	Total	Authorized	Deficit
Captains	5	2	7	7	0
Helmsman	19	5	24	7	17
Seamen	24	9	33	22	11
Engineer	3	1	4	2	2
Assistant Engineer	7	4	11	0	11
TOTAL	**58**	**21**	**79**	**38**	**41**

Table 34: Crew requirements for GNP vessels

In operations control and administration tasks of the unit, there is a deficit of four persons, of which at least two should be urgently incorporated for Operations Control activities:

Administrative Personnel	Required (minimum)	Backup personnel	Total	Authorized	Deficit
Marine Control	1	0	1	1	0
Head of Operations Control	1	0	1	0	1
Park Wardens – operations control	3	1	4	2	2
Radio operators	1	0	1	0	1
Marine Biologist	1	0	1	1	0
Fisheries Manager	1	0	1	1	0
Park Wardens	2	0	2	2	0
Fisheries inspector	3	0	3	3	0
Monitoring specialist	1	0	1	1	0
Conservation Official	1	0	1	1	0
Secretary	1	0	1	1	0
TOTAL	**16**	**1**	**17**	**13**	**4**

Table 35: Required GNP Administrative Positions for the GMR

In Maintenance and Repairs, the GNP has a deficit of seven persons, as outlined below (observe the technical skills which are required):

Technical Personnel	Required (minimum)	Backup personnel	Total	Authorized	Deficit
Head of Maintenance	1	0	1	1	0
Electrician	1	0	1	0	1
Outboard motor engineer	1	0	1	1	0
Diesel motor engineer	1	0	1	0	1
Assistant mechanics	2	0	2	0	2
Logistics coordinator	1	0	1	1	0
Cooling systems technician	1	0	1	0	1
Welder	1	0	1	0	1
Secretary-Archivist	1	0	1	0	1
TOTAL	**10**	**0**	**10**	**0**	**7**

Table 36: Required Administrative and Technical Personnel for the GMR

Size and Complexity of the Marine Area

The area of interest is vast (>133,000 Km2) and the support posts are located mainly in the southeast, making the opposite area (north and northeast) complicated to patrol.

Enforcement Vessels

The three offices (Cristóbal, Santa Cruz, Isabela), currently have 15 vessels. Vessel type, name and category are listed below:

Type	Name	Type/category	Length (meters)	Top speed & Autonomy	Gross Tonneage	Administration Office
Marine	*Guadalupe River*	Oceanic	30.50 m	21 Kt, 5d	120.41 TM	Santa Cruz
	Sierra Negra	Oceanic	33.37 m	11 Kt, 15d	209.6 TM	Santa Cruz
	Yoshka	Oceanic	28.80 m	22 Kt, 4 d	105.63 TM	Santa Cruz
	Sea Mar	Semi- Oceanic	11.80 m	20 Kt, 4 d	17.07 TM	Santa Cruz
	Araucaria	Semi- Oceanic	10.01 m	16 Kt, 3d	19.13 TM	San Cristóbal
	Tiburón Martillo	Floating Base	15.5 m	0 Kt, 30 d	30.50 TM	Santa Cruz
	Sea Ranger 1	Speed boat	7.5 m.	15K, 6hs	<20 TM	Santa Cruz
	Sea Ranger 2	Speed boat	11.0 m	25K, 6hs	<20 TM	Santa Cruz
	Sea Ranger 3	Speed boat	11.0 m	25K, 6hs	<20 TM	Santa Cruz
	Sea Ranger 8	Speed boat	7.5 m	25K, 6hs	<20 TM	San Cristóbal
	Sea Ranger 9	Speed boat	11.0 m	25K, 6hs	<20 TM	Santa Cruz
	Sea Ranger 10	Speed boat	10.5 m.	25K, 6hs	<20 TM	Cristóbal
	Sea Ranger 11	Speed boat	11.0 m	25K, 6hs	<20 TM	Isabela
Terrestrial	Bolívar Base	Hut	n.a.	n.a.	n.a.	Santa Cruz
Aerial	Sea Wolf	Airplane	n.a.	6 hs	n.a.	Santa Cruz

Table 37: GNP Enforcement and Logistical Support Vessels
Source: GNP Records

Vessel maintenance and upkeep is a key issue; when this is not conducted properly it gives the false impression that more vessels and a higher operational budget are required. In reality, what is required is an efficient maintenance system. The unnecessary growth of the fleet without a proper support system should be avoided as this would only worsen the situation.

The increase of investments in patrolling resources for the GMR which occurred between 2001 and 2005, generated additional pressure on expenses (Annual Operational Budget – AOB); this relates to salaries, fuel, lubricant, per diems, travel support, insurance, tools, expendable materials. This reached a point in 2006 and 2007, when the AOB exceeded US$2,300,000 (including costs of Operation and Maintenance). This placed enormous pressure on maintenance and repair systems, which overwhelmed the logistical and technical capacity of the GNP along with the administrative processes linked to the unit. Despite this, there was even talk of purchasing more vessels.

The growth of the fleet was not a result of technical planning, but rather the result of donations and financing opportunities that were snapped up rapidly. Unfortunately, initial investment in boats can generate huge ongoing costs.

Under this scheme, the cost-efficiency indices of enforcement reflected a progressive deterioration so that by May 2006, all GNP vessels were non-operational. With the support of several NGOs, the GNP was able to start a comprehensive maintenance program, technical support and key spare part purchases in the second half of that year.

These actions later resulted in a significant increase in operations and vessel availability for 2007, 2008 and 2009. The improvement project started with an efficiency indicator (measured in patrol hours) obtained from various sources (Port Captain and GNP records) in order to track changes.

By the end of 2006, the mean monthly operation time per vessel was:

Vessel Type	Mean Monthly Registered Hours	Hours of Operation Under Normal Conditions
Oceanic Vessels	45.5 hours/month	360 hours/month
Sea Rangers (fiberglass boats)	27.7 hours/month	168 a 240 hours/month

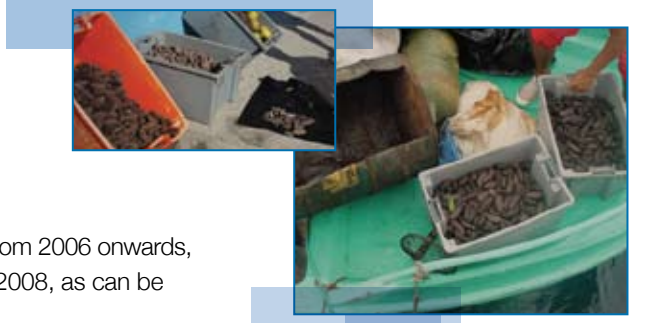
Table 38: Operational condition of GNP vessels. Second semester 2006
Source: GNP Records. GNP Zonation for control and surveillance
Edited by: WildAid. Oswaldo Rosero and Marcel Bigué

The GNP reviewed the vessel requirements as a function of violation statistics by geographical sector. Surveillance subsectors were created in accordance with Table No.40 to focalize patrolling effort. In consequence, vessels were reassigned to different geographical areas depending on the operation type:

Figure 9: GMR Control and Surveillance Sectors

Marine Area	Vessel Requirements	Area (Nm²)	Quantity
North Sector (Darwin and Wolf) – SECTOR 1	Floating base Semi-oceanic vessel Fiberglass speedboat (Sea Ranger)	Darwin and Wolf	1 1 1
Isabela (South and West, P. Villamil and Canal Bolívar) SECTORS 3 and 4	Oceanic Vessel Fiberglass speedboat (Sea Ranger) based on land (Canal Bolívar) Fibra (Sea Ranger) based at Pto. Villamil	S3: 3,509.38 S4: 5,146.61	1 1 1 1
Interior Waters (Isabela-S. Cruz-S. Cristóbal), SECTOR 7	Fiberglass speedboat (Sea Ranger)	4,404.74	2
North-east Sector (Genovesa S. Cristóbal), SECTOR 6	Oceanic Vessel	S6: 18,914.41	1
South-coastal Sector SECTOR 6 and 5	Fiberglass speedboat (Sea Ranger)	S5: 3,417.46	1
South Sector SECTOR 2	Semi-oceanic vessel	5,068.13	1
Logístics	Oceanic Vessel Fiberglass speedboat (Sea Ranger)	0	1 1
Entire GMR	Airplane	0	1
TOTAL			**15**

Table 39: Number of vessels required for GNP surveillance by geographical sector



Vessel Availability and Annual Days of Operation

The improvement in maintenance and spare parts provision systems applied from 2006 onwards, generated a considerable increase in the number of operations in 2007 and 2008, as can be observed in the figure below:

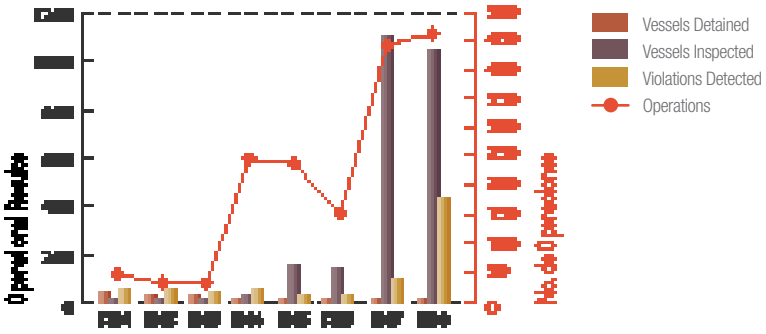


Figure 10: Annual number of surveillance and control operations, GMR
Source: Galapagos National Park Service

The international NGOs will maintain their technical support for three or more years. However, the GNP has not been able to strengthen the areas of logistics and technical support, so the weakness persists and a process should be proposed which tackles the various critical points which have been identified as follows:

- Lack of a head engineer in charge of maintenance.
- Outdated preventative onboard maintenance plans.
- Excessive spare parts purchase time or frequent mistakes which result in restarting the entire process.
- Lack of trained Park Wardens.
- Lack of a training program.

Surveillance Technology

Onboard Equipment

Oceanic and Semi-Oceanic Vessels	Fiberglass Speedboats (Sea Rangers)
S-bandwidth radar (long distance surveillance). Only oceanic vessels.	X-bandwidth radar (precision close range surveillance)
X-bandwudth radar (precision close range surveillance)	GPS with incorporated digital map. Fixed and handheld.
GPS with incorporated digital map. Fixed and handheld.	Automatic Radar Plotting Aid (ARPA)
Automatic Radar Plotting Aid (ARPA)	Radios VHF con tecnología DSC
Automatic Identification System – AIS	Binoculars
Vessel Monitoring System – VMS (satellite)	Night vision equipment
HF and VHF radio with DSC technology	Video camera
Video camera/photographic camera/night vision equipment/binoculars	Photographic camera

Table 40: GNP vessel equipment

The floating base in the north (Darwin and Wolf) and the Bolivar Base both have satellite telephones. Other satellite telephones are carried depending on the situation but are not part of the permanent equipment. We consider that all vessels are well equipped.

Long Distance Monitoring System

Between 2006 and 2007, the Maritime Authority and the Galapagos National Park (Resolution DIGMER 054/2007) planned to implement a satellite Vessel Monitoring System (VMS). The Maritime Authority established that all national vessels greater than 20 Gross Tons must have a satellite-monitoring device; within the Galapagos Marine Reserve this should be extended to vessels smaller than 20 tons which venture further than the bay areas. The vessel owner pays for both the equipment and the monitoring service. There are currently five service providers that, after technical qualification from the Maritime Authority, compete on a free market. The equipment costs range from US$1,200 and US$1800, whereas the service ranges from US$56 and US$70 per month. For smaller vessels the following two options exist: an extension of the VMS or the installation of Automatic Identification System (AIS), which does not have a recurrent cost. The implementation of the monitoring system for vessels smaller than 20 tons in the GMR has yet to occur, and although the regulatory framework was created in December 2007, the operational details, and economic and technical aspects are still being defined.

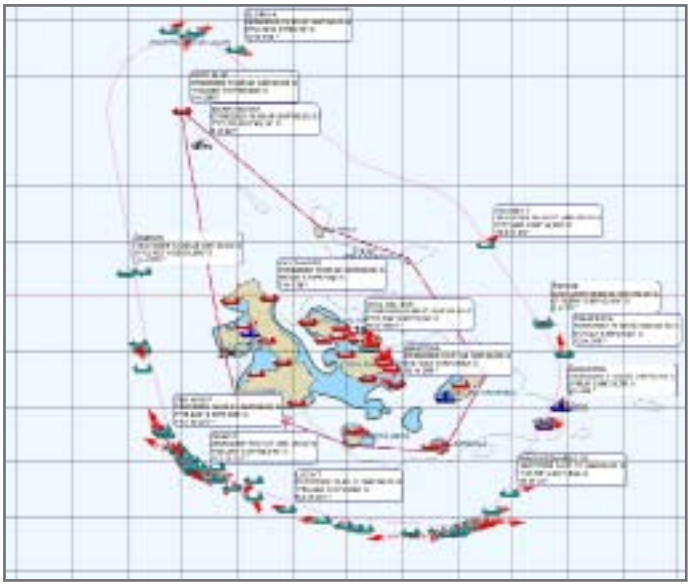


Figura 11: Satellite Monitoring System image. PNG 2009

It is expected that the next phase will constitute a hybrid system between VMS and AIS to cover:

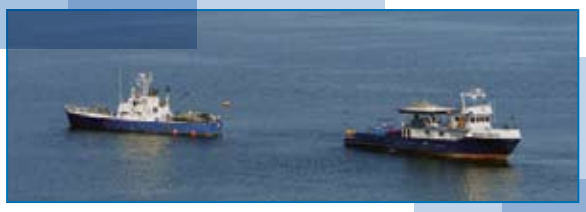
- VMS: Extensive areas, remote and with slow vessels.
- AIS: Coastal zones, port arrival, transit routes and high speed vessels.

Settlement proximity and multiple uses of the MPA

There are four settlements within the GMR:

- Puerto Baquerizo: 7,211 inhab.
- Puerto Ayora: 14,886 inhab.
- Puerto Villamil: 2,117 inhab.
- Puerto Velasco Ibarra: 120 inhab.

Source: Ecuadorian Institute for Censuses and Statistics – INEC. Projected for 2009.



Proximity to Maritime Traffic Routes

The GMR is not in the path of international marine traffic routes, but there is a permanent presence of industrial fishing vessels, cargo boats (at the time of writing this report there were seven ships which supplied the islands), and tourism vessels transiting between visitor sites. In 2005, the IMO declared the GMR a Particularly Sensitive Sea Area (PSSA). As a result, the Maritime Authority was obliged to create entry and exit routes, and to strictly regulate (and even prohibit) the transit of vessels requiring the right of innocent passage. This has not been formally implemented, giving rise to violations and offences which go unpunished while the regulations are still pending. Our opinion is that the GMR should have only one entry and exit point and that all "innocent passage" should be prohibited. As a result, we were made aware that right of innocent passage is often required by vessels from the tuna fleet when they are pursuing a school of fish, or when they have planned to deploy a fish aggregating device (FAD), so the transit in reality is part of a highly efficient mechanized fishing operation.

Surveillance Organization and Planning

The GNP does not have an established formal system of gathering intelligence, rather it relies on circumstantial and casual informers. Operations planning is more empirical than technical. However, the Coastguard (which possess an oceanic patrol boat, a coastal patrol boat and four speed boats) carries out its surveillance under Navy protocols. Joint operations have been strengthened but there are still no common protocols or procedures. It is clear that resources are often underestimated or underutilized, as is the case when the Navy designates an exploration hydroplane, or when the GNP deploys its plane. Put simply, inter-institutional coordination is still insufficient.

Capacity to Cover Area of Interest

Patrol operations within the GMR have sufficient vessels, especially when the coastguard vessels assigned to the region are included. Zoning has also permitted a certain amount of local autonomy in the technical offices of the GNP (Puerto Baquerizo, Puerto Villamil, Canal Bolívar Base, Tiburón Martillo floating base and Puerto Velasco.

Analysis of Contacts

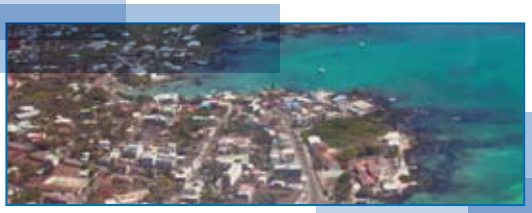
The crews and personnel at the control center evaluate the movements of suspicious vessels according to their positions over time, direction, speed and positions between vessels (sometimes violations are committed by several vessels working together). This analysis of positions, direction and speeds permits the authorities to determine whether the vessel is fishing, undertaking a maneuver (receiving or handing over cargo) or simply transiting. All crew members are IMO accredited by the Maritime Authority to undertake operations at sea. Cargo vessels are also scrutinized to confirm the safety of their route and in the case of tour vessels: transit, itinerary and time spent at visitor sites are all verified. The level of operation and training for these aspects is acceptable but there are no refresher courses or evaluation periods to ensure that standards are maintained or to incorporate new forms of analysis.

Vessels Used by Violators and Types of Operation

Type of violation depends on the vessel and the activity. The following matrix summarizes these in detail:

Vessel Type and Violation / Offence	Mode of Operation
Industrial fishing: • Illegal fishing	Medium speed vessels (12 to 15 knots) which may have onboard helicopters, fish aggregating devices, remote oceanographic and atmospheric sensors. Between 150 and 1500 tonnes cargo space. The tuna fleet falls into this category. They enter at night or request right of innocent passage. They deploy fish aggregating devices (FADs) with remote monitoring systems and then return to set their gear.
Semi-industrial vessels • Illegal fishing • Trafficking of species • Drug trafficking • Fuel smuggling • Trafficking of people	Vessels from 20 to 150 tonnes which operate at low speeds but with autonomy of up to 15 days. Low technology. They use longline or seines or take small outboard motorized vessels to make the fishing operation more effective. When using boats they come near the GMR and send the boats into the protected area to fish, because these are more difficult to detect, while the main vessel acts as a mother boat outside the limits of the marine reserve. These are also the boats favored by drug and people traffickers in transit to northern countries. They operate by circling the GMR to the south and receiving local support in the sector around southeast Isabela. Local inhabitants bring water, fuel and supplies in their fiberglass boats and sell them to the smugglers. Coordination between the smugglers and the locals is done via satellite phone. Another form of operation is to receive illegal fish catches or protected species which have been fished by local persons and stored in the urban or rural zone. The boat comes to the limit of the marine reserve and coordinates via satellite phone with the local fiberglass vessel transporting the illegal shipment from port.
Artisanal vessels • Illegal fishing • Species trafficking • Logistical support for traffickers	These are speedboats smaller than 7.5 meters length which leave secretly from port and fish illegally under request from traffickers or intermediaries. They return to port at night and land their catch for pre-processing in urban or rural areas. They can be detected from the amount of luxury spending they carry out in a relatively small society. In extreme cases, there are artisanal vessels which leave from Puerto Baquerizo and sail to Manta to hand over their illegal catch.
Transport vessels • Unauthorized tourist activities	These are vessels of up to 16 passengers which usually transport people between islands They occasionally offer tourist services to visitors although they are not licensed to do so and do not fulfill the minimum safety or service quality requirements.
Tourism vessels • Unauthorized tourist activities • Species introduction	These are vessels which legally provide cruises or day tours in accordance with current regulations. However, in aspects of biosecurity or prevention/contingency control, the system is vulnerable and there are one to three accidents each year. Due to their illumination, these vessels are vectors used by insects to spread between islands.
Cargo vessels • Species introduction • Risk of pollution • Trafficking of species • Drug trafficking • Trafficking of people	There are seven vessels which provide a cargo service between the continent and Galapagos. This activity has very few regulations and those which do exist are not followed. They are not being regulated for issues of biosecurity. They are mostly (except two) obsolete ships which have ended their expected life span and should not be entering a fragile zone under these conditions. There is a high risk of shipwreck, strandings and oil spills. This is a method used by illegal immigrants to enter the islands. It is also used to enter drugs and export shipments of protected species (sea cucumbers, shark fins, lobster etc).

Table 41: Illegal Activities and Violations in the GMR.



Offenders dedicated to the trafficking of species, drugs or fuel smuggling, use local people for a variety of purposes. All these illegal activities are planned in the inhabited zones, where the products to be smuggled are often stored. It is important to note that the smugglers provide advance cash to their collaborators, to ensure their commitment. The Environmental Police (UPMA) operates in coordination with the GNP to counteract these offences.

Level of Involvement of the Population

Galapagos possesses a new immigrant population whose main objective is to secure a financial future or make the most of any opportunity (there is no sense of "belonging" to the place where they live). The original local population, which had assimilated to the surroundings and developed a culture of respect towards the islands, no longer has the influence it once had. Economic gain, rather than respect and promotion of conservation or management of protected areas, motivates present day Galapagos society. There is also a sense of solidarity among the local population. In such a small society it is obvious who is committing illegal activities yet, due to close-knit relationships, no one collaborates with the authorities. There are no voluntary reports and, generally, the community will support an offender even to the point of confronting authorities.

Detection Probability

The case of the GMR is complex due to its vast area, the great distances to sites, and the resulting reduced onsite patrol time. Additionally, offenders use smaller vessels, which reduce the maximum effective detection distance (sweep width). Under this scenario, we analyzed two of the most critical areas:

- Zones 1-6:18,914.41 nm^2 (North, North-East Sectors)
- Zone 3: 3,509.38 nm^2 (SouthWest Sector).

By applying the equation to a range of variables for both the exploration distance (which is equal to the time spent onsite, using a reference of a standard patrolling velocity of 10 knots) and the Maximum Effective Detection Distance (which represents different sized contacts or visual/radar detection means), we obtain the following relationships:

Maximum Effective Detection Distance (nm)

Distance Covered (Nm) or Hours Patrolled Nm/120	Maximum Effective Detection Distance nm							
	6	8	10	12	14	16	18	20
130	4.04%	5.35%	6.64%	7.92%	9.17%	10.41%	11.64%	12.84%
140	4.34%	5.75%	7.13%	8.50%	9.84%	11.17%	12.47%	13.76%
150	4.65%	6.15%	7.62%	9.08%	10.51%	11.92%	13.30%	14.67%
160	4.95%	6.54%	8.11%	9.65%	11.17%	12.66%	14.12%	15.56%
170	5.25%	6.94%	8.60%	10.22%	11.82%	13.39%	14.94%	16.45%
180	5.55%	7.33%	9.08%	10.79%	12.47%	14.12%	15.74%	17.33%
190	5.85%	7.72%	9.56%	11.36%	13.12%	14.85%	16.54%	18.20%
200	6.15%	8.11%	10.03%	11.92%	13.76%	15.56%	17.33%	19.06%
210	6.44%	8.50%	10.51%	12.47%	14.40%	16.28%	18.11%	19.91%
220	6.74%	8.89%	10.98%	13.03%	15.03%	16.98%	18.89%	20.76%
230	7.04%	9.27%	11.45%	13.58%	15.65%	17.68%	19.66%	21.59%
240	7.33%	9.65%	11.92%	14.12%	16.28%	18.37%	20.42%	22.41%

Table 42: Detection Probability, P (det) ZONE 1-6, with a patrol boat

The calculation analyzed a distance of between 130 and 240 Nm (approximately 13 to 24 hours onsite), and in the best of cases, P (det) is 22.41%, when the vessel has covered 240 Nm and the maximum detection distance is 20 Nm (radar).

Analysis: Zone 1 – 6 is remote and vast.The GNP vessels which patrol the zone take 6 to 7 hours to reach the appropriate site to begin exploration, and they must leave the site with enough time to reach their home ports. The effective time onsite (patrol time) is significantly reduced. Surveillance in this zone is complicated and inefficient. They should coordinate with the Coastguard and implement electronic surveillance (Radar+VMS+AIS) to improve the indicator, but in any case this zone will remain a vulnerable area.

Under the same procedures, we analyzed the difference if the airplane is used in exploration (the GNP "Sea Wolf"). We kept the same maximum detection distances but observe how the distance covered per unit of time is much greater.

Zones 1—6

Distance Covered (Nm) or Hours Patrolled Nm/120	Maximum Effective Detection Distance nm							
	6	8	10	12	14	16	18	20
120, 1 h	3.74%	4.95%	6.15%	7.33%	8.50%	9.65%	10.79%	11.92%
150	4.65%	6.15%	7.62%	9.08%	10.51%	11.92%	13.30%	14.67%
180	5.55%	7.33%	9.08%	10.79%	12.47%	14.12%	15.74%	17.33%
210	6.44%	8.50%	10.51%	12.47%	14.40%	16.28%	18.11%	19.91%
240, 2 h	7.33%	9.65%	11.92%	14.12%	16.28%	18.37%	20.42%	22.41%
270	8.21%	10.79%	13.30%	15.74%	18.11%	20.42%	22.66%	24.84%
300	9.08%	11.92%	14.67%	17.33%	19.91%	22.41%	24.84%	27.18%
330	9.94%	13.03%	16.01%	18.89%	21.67%	24.36%	26.95%	29.46%
360, 3 h	10.79%	14.12%	17.33%	20.42%	23.39%	26.25%	29.01%	31.66%
390	11.64%	15.21%	18.63%	21.92%	25.07%	28.10%	31.01%	33.79%
420	12.47%	16.28%	19.91%	23.39%	26.72%	29.90%	32.95%	35.86%
450	13.30%	17.33%	21.17%	24.84%	28.33%	31.66%	34.83%	37.86%

Table 43: Detection Probability, P (det) ZONE 1-6, with airplane

Analysis: By using the plane, the same P(det) is achieved in two hours as a patrol boat achieves in over 24 hours. Unfortunately, the plane has a reduced maximum patrol time of only 4 hours.

Nonetheless, the probability of detecting a contact with the airplane is still low (less than 35%-25%). The cost-efficiency ratio of patrolling this area of the GMR is very difficult to optimize so any plan that is developed must always balance the combined use of these resources to minimize waste. In order to improve surveillance, we recommend using autonomous AIS sensors at Pinta, Genovesa and on board the floating base "*Tiburon Martillo*." In addition, coordination could be improved between the GNP and coastguard vessels so that patrol boats can remain onsite as long as possible.

The GNP airplane "Sea Wolf", despite being relatively new, has serious maintenance issues and is out of service for long periods of time (over a year at the time of preparing this report). The GNP added the plane without establishing an internal support structure and now, three or four years after acquisition, it spends long periods of time inoperative. As a result, the benefit of having an airplane is lost if the institution does not have the capacity to support it; poor maintenance means that it spends most of the time sitting in a hanger.

P (det) is greatly improved in smaller areas as can be observed from the following calculation for ZONE 3 using a patrol boat which covers 30 to 140 nautical miles in the sector (3 to 14 hours onsite):

Zone 3

Distance Covered (Nm) or Hours Patrolled Nm/120	Maximum Effective Detection Distance nm							
22.62%	6	8	10	12	14	16	18	20
30	5.00%	6.61%	8.19%	9.75%	11.28%	12.78%	14.26%	15.72%
40	6.61%	8.72%	10.77%	12.78%	14.75%	16.67%	18.55%	20.38%
50	8.19%	10.77%	13.28%	15.72%	18.08%	20.38%	22.62%	24.79%
60	9.75%	12.78%	15.72%	18.55%	21.29%	23.93%	26.49%	28.96%
70	11.28%	14.75%	18.08%	21.29%	24.37%	27.32%	30.17%	32.90%
80	12.78%	16.67%	20.38%	23.93%	27.32%	30.56%	33.66%	36.61%
90	14.26%	18.55%	22.62%	26.49%	30.17%	33.66%	36.97%	40.12%
100	15.72%	20.38%	24.79%	28.96%	32.90%	36.61%	40.12%	43.44%
110	17.14%	22.18%	26.91%	31.35%	35.52%	39.44%	43.12%	46.57%
120	18.55%	23.93%	28.96%	33.66%	38.04%	42.14%	45.96%	49.53%
130	19.93%	25.65%	30.96%	35.89%	40.47%	44.72%	48.66%	52.33%
140	21.29%	27.32%	32.90%	38.04%	42.79%	47.18%	51.23%	54.97%

Table 44: Detection Probability, P (det) ZONE 3, with Patrol Vessel

Analysis: Patrols in smaller areas of the GMR do present acceptable Detection Probabilities. However, these values are only real while the vessel is onsite and as we mentioned earlier, the availability indices are critically low, so the capability for surveillance tends towards zero.

The presence of the Base at Canal Bolivar ensures a permanent surveillance of the western coastal area of the GMR, which generates a similar result to that of the northern sector. This base does not have exploration sensors, so we recommend installing a radar or AIS receiver. Finally, the calculated results assume a random search within the area of interest, but as soon as the vessel is provided intelligence or a search pattern is developed at Operations Control (as is the case with VMS control), the probability of detection rises dramatically. It is for this reason that we stress the importance of strengthening combined patrols, maintenance improvement, use of sensors and intelligence-gathering technology, and mutual support between GNP and coastguard vessels.

Interception and Arrest

The patrol vessels have sufficient speed and autonomy to carry out their work. They can all go faster than 20 knots and the autonomy of oceanic vessels is greater than four days. The GNP has an established marine base and, for this reason, interventions routinely comply with procedures. However, there are no established training programs. In 2008, there were 337 patrols, far more than other marine operations undertaken (a total of 460).

1,782 days were spent patrolling, which is an average of 5.29 days of patrolling for each operation. This is an acceptable figure in terms of detection optimization, interception, and detention in the sub-areas. There is 100% efficiency in terms of vessels sighted and those inspected, as the following graph shows:

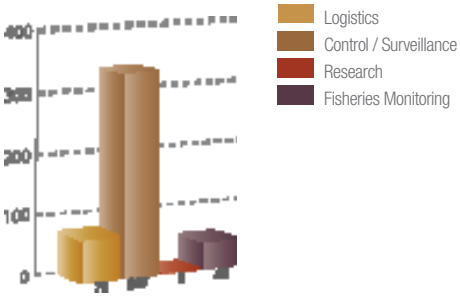


Figure 12: Type of marine operation in the GMR, 2008

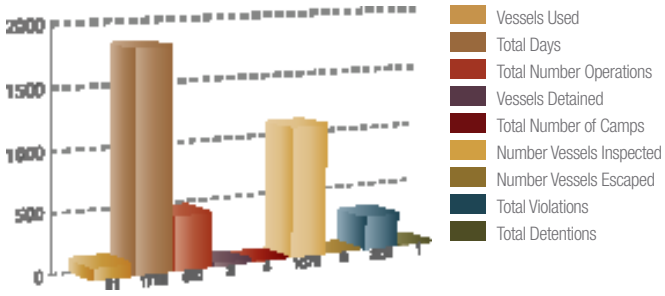
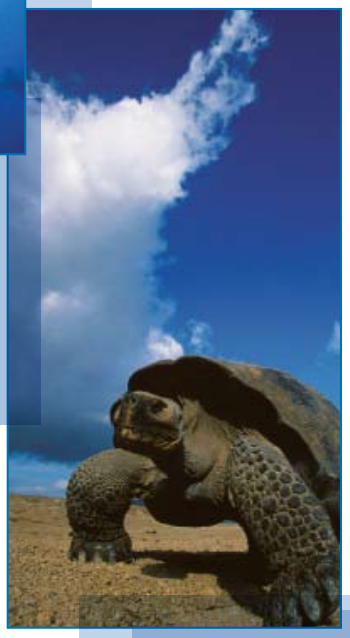


Figure 13: Surveillance and Control Indicators

1,079 vessels were inspected of which eight were detained. None of the interception attempts failed. 308 violations were reported during the year.

The GNP does not have a standardized training procedure for boarding vessels. The occasional training course has been given, but constant crew rotations (crew were not core staff until the present year) caused the knowledge to be lost over time. The job instability faced by crew also meant that it was not worth investing in training as their employment was only assured for one year. Currently, all temporary staff have been made permanent, but this is not enough to fill all positions. There are still no standardized protocol or training programs that ensure operational efficiency. These aspects require immediate attention because, in recent months, drug smuggling boats have been detected. Boarding these vessels is a high-risk action which requires better personal protection equipment and safe interception procedures.

All boarding procedures are carried out in the presence of a Coastguard official, who has the legal power to make arrests. Park Wardens do not. Coastguard crews also suffer from the lack of familiarity with the boarding procedures. A handbook is envisaged which will provide instructions for boardings, inspections, collection and handling of evidence, crime scene investigation and intervention reports.



Prosecution

In 2008, the main violations detected were the following:

Type of Violation	Quantity (2008)
Industrial fishing	2
Unauthorized entry	13
Vessel without fishing permit	3
Fisher without license (PARMA)	46
Fishing in closed areas	17
Fishing in closed seasons	1
Fishing of protected species	8
Illegal camps	1
Obstruction of Park Warden duties	3
Others: • Tourist vessels (change of itinerary, unauthorized activities) • Cargo, fuel and transport vessels which entry prohibited areas, discharge of sewage • Expired licenses or patents due to non-operation/sale of resources out of season	212
TOTAL	**306**

Table 45: Principal violations 2008

It must be emphasized that in 2008 and the first half of 2009 there have been six accidents involving tour vessels or vessels of other types which have presented an imminent environmental and safety risk. The table below outlines the cases opened by the GNP between 2002 and 2009.

General Summary				
Year	Number of Cases Opened	Number of Cases Resolved	Number of Cases Pending	Percentage of Unresolved Cases
2002	87	81	6	6.89%
2003	119	100	19	15.96%
2004	106	94	12	11.32%
2005	95	74	19	20.0%
2006	129	112	17	13.17%
2007	338	289	49	14.49%
2008	134	60	57	42.53%
2009	104	65	48	46.15% (*)

Table 46: Principal violations 2009 (*) to date, the fiscal year has not ended

A "resolved case" does not necessarily mean that the result has been favorable to the Environmental Authority, but simply that judgement was passed and the case concluded. As we will see in the next section, this detail greatly changes the efficiency indicators of the processing stage.

The processing indicators are not satisfactory, and this corresponds to the fact that in 2007 and 2008 there was a massive screening of the fishing register. Various NGOs have opted to provide legal assistance to the GNP with additional lawyers to strengthen the legal team. When there are no procedural defences (internal and external), administrative processes should not take more than 2 months. However, judicial processes are neither fast nor effective. Many cases take years to be resolved, and in most cases do not favor the plaintiff. The Environmental Authority drives and monitors the legal processes, and participates by presenting the accusations and providing evidence of the violations committed. In administrative processes there are often cases of mistaken identity as the offenders commonly do not carry identification documents. A system to measure the accumulation of violations is necessary; this is a flaw that dates back to the LOREG. This is needed so that harsher sanctions can be imposed on recurrent offenders, culminating in the loss of the privileges established for those carrying patents, permits, or licenses.

Sanctions and Sentencing

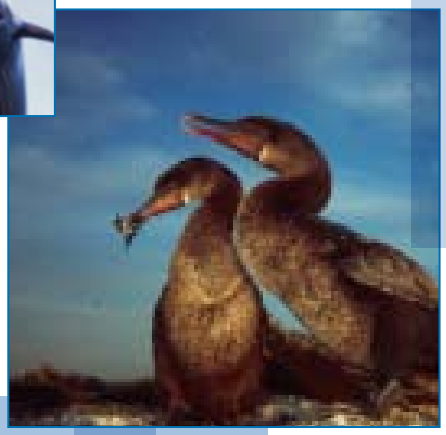
In administrative cases, the percentage of sanctions is close to 100% in favor of the GNP, although this does not necessarily imply the success of all the processes against violators – GNP processes are not fast enough and several cases have been lost or misplaced. Sanction time is between 2 and 24 months, and the percentage of sentences in favor of the Environmental Authority is 56% (taking as a sample the screening process of the fisheries register in 2007).

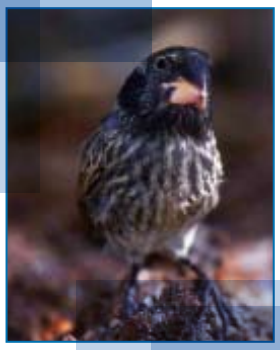
2007			
Cases Resolved	Cases Lost	Appeals	Delays
63	35	5	6

Table 47: Administrative Cases in 2007 corresponding to the Screening Process of the Fishing Register

These figures are not a good indicator for an activity that is completely under the jurisdiction of the GNP, and there are certain aspects which must be highlighted:

- 5% of administrative cases have not been resolved for over 2 years. This is unacceptable given that these are purely internal processes.
- 32% of cases were lost resulting from either poor evidence collection, incorrectly following a procedure, or lack of transparency.





The following figure summarizes Table 47:

Efficiency of Administrative Processes
(Fishing Register Screening Process) 2007

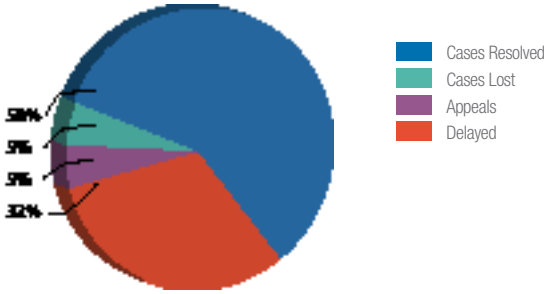


Figure 14: 2007 Administrative Cases corresponding to the Fishing Register Screening Process

Judicial processes are a much larger problem due to several critical points:

- All the administrative systems are manual and obsolete.
- Discrepancies between the Maritime Authority and the Environmental Authority.
- Lack of inter-institutional cooperation with the GNP (several projects have been created to support local judicial functioning, but these have not been implemented. For instance, the creation of judicial mailboxes were handed out two years ago but never installed).
- Precarious funding for judicial staff.
- Lack of knowledge of environmental law.
- Corruption.
- Cases are taken outside the Province of Galapagos to Guayaqui.

In the case of judicial processes, authorities need to modernize the system. Processes are outdated and updating is unjustifiably prevented. This would be of great benefit given the time taken for documents to travel between islands or to the continent.

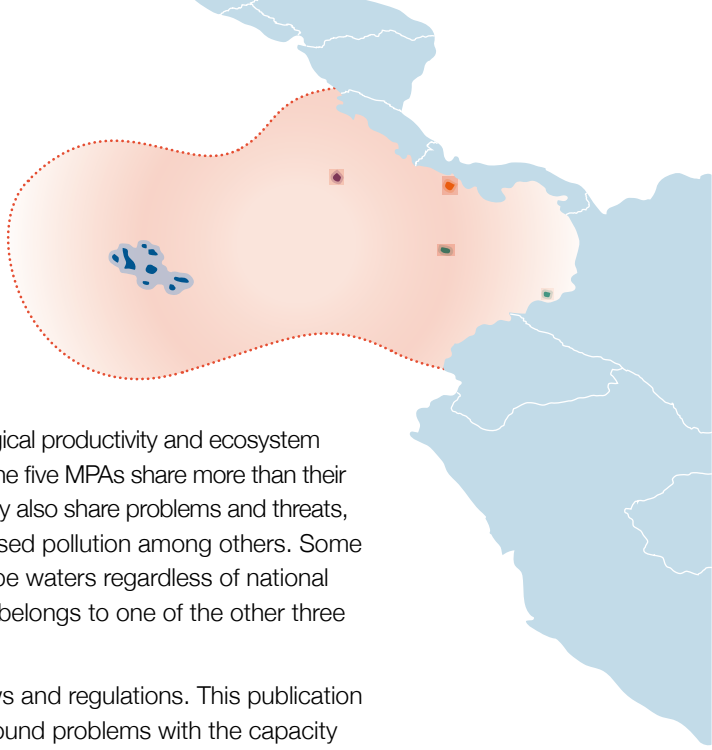
Recommendations
Galapagos Islands, Ecuador

Surveillance and Detection	
Critical Aspect	Excessive size of artisanal fishing fleet and number of fishers.
Recommendation	Screen the fishing register in accordance with fishing capacity and whether fishers remain in the activity. Initial phase complete.
Feasibility	High. Only requires a technical decision by the GNP and NGOs will be able to cooperate. After the screening process, subsidies and focalized incentives can be fixed.
Estimated Cost	US$25,000.
Critical Aspect	Illegal entry of industrial vessels under different mechanisms: • Innocent passage. • Entry of smaller boats from outside the GMR limits. • Use of local pangas.
Recommendation	1) Apply IMO rules for right of innocent passage, and those pertaining to the Particularly Sensitive Sea Areas. 2) Focus patrols along the borders of the GMR in mutual collaboration with the Coastguard Service.
Feasibility	Medium. Requires lobbying the Marine Authority for the implementation of this IMO requirement.
Estimated Cost	US$15,000 for technical assistance and meeting coordination.
Critical Aspect	Growth of the number of vessels dedicated to tourism without a corresponding increase in control capacity. No automated control of vessels smaller than 20 Extensive area to patrol.
Recommendation	1) Apply technology to control: VMS and AIS. Automate itinerary control. 2) Add vessels smaller than 20 tons to the electronic AIS-VMS control system. 3) Put in place a mechanism of corrective actions for irregularities or bad practices.
Feasibility	Medium. Requires enormous political commitment and technical ability. If achieved, political will would be backed by other national, international, private and state institutions.
Estimated Cost	US$350,000 for technical assistance and implementation of an automated control system, operational regulations (complementary norms), quality control system, technical personnel and inspector qualification and training, and an inspection system.

Surveillance and Detection (cont.)	
Critical Aspect	No onboard and dry dock maintenance plans.
Recommendation	1) Design and implement onboard and dry dock maintenance plans: logbooks, records templates, weekly status reports. 2) Change purchasing system. 3) Hire the following permanent staff: Head of Maintenance with ISM qualifications, electrician/ welder, naval engine technician. 4) Continuous personnel training.
Feasibility	1) Medium. 2) Low. 3) Low due to the existence of limited salary caps. 4) High.
Estimated Cost	1) US$50,000 for technical assistance one the GNP has hired a Head of Maintenance. 2)US$15,000. 3)US$60,000 per year. 4) US$30,000.
Critical Aspect	Optimization of the number of vessels and crew sizes.
Recommendation	1) Implement electronic surveillance methods. 2) Reduce vessel patrolling activities. 3) Optimize donations.
Feasibility	1) High. 2) Medium. 3) Medium.
Estimated Cost	US$50,000.
Critical Aspect	Trafficking of species and illegal fishing.
Recommendation	1) Inspect cargo vessels prior to sailing using sniffer dogs. 2) Establish a group of private investigators to obtain information about illegal activities.
Feasibility	1) Medium. Requires political will from stakeholders. UPMA and Navy. 2) High. Depends on external financing.
Estimated Cost	1) US$25,000 for technical assistance and implementation of inter-institutional intervention procedures. 2) US$25,000.

Interception and Arrest	
Critical Aspect	Institutional interference in the setting of regulations.
Recommendation	1) Correct flaws in marine environmental law (new Galapagos Special Law) and specify roles and competencies of those involved. 2) Develop joint operational procedures between institutions.
Feasibility	Medium. Delegates from the institutions involved should be included.
Estimated Cost	US$25,000. Included in the operational costs of the institutions and NGOs involved.
Critical Aspect	No boarding procedures and no refresher training for personnel.
Recommendation	1) Establish a boarding procedure (Navy-GNP-Environmental Police). 2) Annual training course for boarding procedures and crime scene investigation Navy-GNP-Environmental Police).
Feasibility	1) High. 2) High.
Estimated Cost	1) US$10,000. 2) US$15,000.
Critical Aspect	Lack of knowledge of environmental legislation on behalf of the judges.
Recommendation	Encourage annual workshops attended by Port Authorities, Judges and GNP, to review procedures.
Feasibility	High.
Estimated Cost	US$10,000 to support seminars, or evaluation and training workshops.
Critical Aspect	Institutional interference in the arrest and processing (Navy-GNP). Initialization of legal proceedings lacks coherence.
Recommendation	Review operational procedures of both institutions by means of a semester efficiency evaluation.
Feasibility	High. Operational evaluation meeting should be organized between both institutions on a regular basis.
Estimated Cost	US$20,000 to ensure that the first meetings take place.

Critical Aspect	Administrative and Judicial processes take too long.
Recommendation	Add 1 or 2 lawyers. Support through NGOs with external lawyers as private plaintiffs.
Feasibility	Medium. Requires political will on behalf of the GNP and Ministry of Environment.
Estimated Cost	US$60,000 per year.
Critical Aspect	Cases of flagrant impunity by exclusively judicial decisions.
Recommendation	Publicize cases in the press.
Feasibility	High.
Estimated Cost	US$5,000 per year.
Critical Aspect	High proportion of administrative cases lost (32%).
Recommendation	Add 1 or 2 lawyers. Review and correct the procedure to open new cases. Establish a procedure to monitor cases on a quarterly basis with technical assistance from NGOs.
Feasibility	Medium. Requires political will on behalf of the GNP and Ministry of Environment. Currently, there is already one lawyer assigned by the NGOs, but external legal support is required for monitoring cases.
Estimated Cost	Included in the previous cost.



Conclusions
Summary of Regional Actions

The Eastern Tropical Pacific is a region of high biodiversity, biological productivity and ecosystem connectivity. Much of its wildlife is endemic and/or threatened. The five MPAs share more than their biodiversity and oceanographic and ecological connectivity – they also share problems and threats, such as illegal fishing, poorly regulated tourism and vessel-based pollution among others. Some of the stakeholders from the four countries fish in the Seascape waters regardless of national jurisdiction. Often a vessel committing a violation in one MPA belongs to one of the other three countries of the region.

All the MPAs also share a poor level of enforcement of the laws and regulations. This publication analyzed the weaknesses in the law enforcement chain and found problems with the capacity to detect and intercept offenders, poor preparation for effective legal cases, difficulties in both administrative and judicial processes, and finally, obstacles which prevent sanctions from being imposed upon violators. The laws that protect the MPAs of the Seascape are only as good as their implementation and enforcement.

The following table summarizes the law enforcement problems encountered by each country in the Seascape. However, if the country does not appear in the list, this does not necessarily mean that the problem does not exist in its MPA. We observed that the same problems tend to occur in one form or another in each of the MPAs.

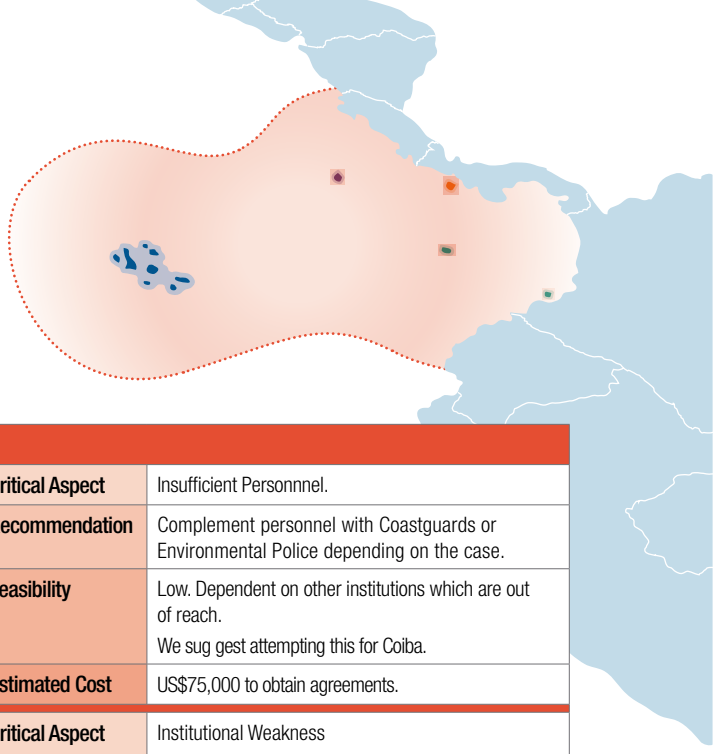
Common Problems

Problem	Recommendation	Country Where Problem is Observed
Uncontrolled population growth.	Improve migration control.	Ecuador
Tourism activities by unlicensed vessels.	Improve coordination between Ministry of Tourism and MPA Authorities.	Ecuador Gorgona, Colombia Panama Costa Rica
Lack of awareness of MPA regulations in neighboring communities.	Awareness campaigns in coordination with NGOs and MPAs.	Ecuador Colombia Panama
Excessive artisanal fleet size.	Screen the fishing register. Reduce fleet size.	Ecuador
Lack of bio-security regulations.	Establish procedures for inspections and quarantines.	Ecuador Colombia Costa Rica Panama
Park Warden salaries not competitive.	Raise salaries and budget or improve per diems.	Colombia Costa Rica Ecuador Panama
Lack of MPA personnel and no job profiles upon which to base appointments,	Increase budget to hire new personnel. Create job profiles for these staff. Produce a Park Wardens Handbook. Increase Park Warden level of training. Create a Regional School for Park Wardens.	Colombia Ecuador Panama Costa Rica

Common Problems (cont.)

Problem	Recommendation	Country Where Problem is Observed
High personnel rotation, especially in Navy.	More frequent training for new personnel. Incentives to encourage personnel stabilization at MPAs.	Colombia Ecuador
MPA income goes to general state treasury and not to MPA. Lack of operational funds.	Encourage decentralization of MPAs. Reorganize MPA financial systems so that income generated remains at MPA. Develop fundraising programs.	Costa Rica Ecuador Panama Colombia
Poor communication between MPA personnel and central headquarters.	Obtain better communications equipment,	Costa Rica Colombia
Poor violation detection rate	Incorporate onboard or land based radar. Obtain more vessels and faster vessels. Increase number of park wardens. Form strategic alliance with NGO, e.g. MarViva. Adopt an electronic vessel monitoring system. Improve coordination between MPA authorities and Navy/Coastguard/Police.	Costa Rica Colombia Ecuador Panama
Tuna vessels enter MPAs.	Adopt an electronic monitoring system. Strengthen patrols. Carry out inspections prior to sailing. Improve coordination between MPA and Police/Navy. Establish buffer zones around MPA. Share maritime information (vessel registers, navigation routes, vessel detention) among Authorities of the four countries. Strengthen sanctions to prevent return to the MPA.	Colombia Costa Rica Ecuador Panama
Lack of control of shark finning.	Review fisheries regulations.	Costa Rica Colombia Panama Ecuador
Lack of vessel maintenance	Provide training in vessel and motor maintenance. Increase budget for vessel maintenance. Implement external technical assistance.	Costa Rica Ecuador Panama Colombia
Lack of an appropriate register of interventions at each link of the law enforcement chain (patrols, detection, interception, arrest, prosecution, sentences).	Design protocols for interventions. Maintain an electronic up-to-date record of violations.	Ecuador Panama Colombia
Impunity of offenders. Slow processes. Interference from the government and institutions in the legal process.	Hire more lawyers. Review procedures. Form alliances with NGOs for legal assistance. In administrative cases, confiscate and destroy fishing gear. Restrict port exit for violators. Detain vessels which have committed violations, and revoke their fishing and navigation permits. Improve coordination between institutions. Improve press relations so that cases are publicized.	Colombia Costa Rica Panama Ecuador
Conflicts of interest between the Fisheries Authority-Fishing Industry and the Environmental Authority.	Reconstitute the Fisheries Authority Executive Board/Board of Directors.	Costa Rica Panama Colombia

This table shows the problems common to all the Seascape MPAs and the need for strategic actions to be taken. Changes may be done on a national level, although they may be more effective if applied from a regional perspective.



Recommendations
Summary of Regional Activities

Surveillance and Detection	
Critical Aspect	Lack of political will to prioritize conservation and sustainable development.
Recommendation	Regional meeting of Ministers and Directors of Protected Areas to present results and establish mechanisms to strengthen each link in each country and encourage regional cooperation.
Feasibility	High. The initial contacts have been made.
Estimated Cost	US$70,000.
Critical Aspect	Limited MPA financial autonomy.
Recommendation	1) Create a local fund using money paid by visitors to the MPAs. 2) Allow the Director of each MPA access to this fund for urgent operational aspects.
Feasibility	1) Low. There is a predominant interest to transfer all funds to the state treasury. 2) A pilot project could be proposed via NGOs for specific actions such as field supplies or spare parts. Some kind of co-management for the MPA between an NGO and the State could be considered (following the example of Belize).
Estimated Cost	US $ 75,000. We recommend applying this to two MPAs, for example Coiba and Cocos.
Critical Aspect	Local Communities do not identify with MPA management.
Recommendation	1) Develop programs within the communities so that they can improve their sense of ownership of the MPA and the benefits it may generate. 2) Work with a university or NGO in order to provide education for the community.
Feasibility	Medium. This is a long-term process of at least 5 years to generate a change. We suggest starting in one specific area such as Gorgona or Coiba.
Estimated Cost	US $125,000 + local counterpart.
Critical Aspect	Low salaries for Park Wardens.
Recommendation	Analyze the possibility of providing per diem in the field or when Park Wardens are on patrol.
Feasibility	Medium. Political will could be generated but this is a timely process. The situation is more critical in Panama and Colombia
Estimated Cost	US $40,000 for one year.

Critical Aspect	Insufficient Personnnel.
Recommendation	Complement personnel with Coastguards or Environmental Police depending on the case.
Feasibility	Low. Dependent on other institutions which are out of reach. We sug gest attempting this for Coiba.
Estimated Cost	US$75,000 to obtain agreements.
Critical Aspect	Institutional Weakness • Lack of records and documentation related to interventions. • Low vessel availability. • Limited maintenance capacity. • Inefficient logistics and purchasing processes.
Recommendation	1) Produce operating and structural manuals according to the mission of the MPA. 2) Establish procedures to document activities, record and store information. 3) Train at least one member of staff in basic maintenance: design and implementation of maintenance plans. 4) Evaluate the current capacity of the maintenance shop and define minimum required equipmen. 5) Generate support projects which subcontract vessel maintenance in the medium term: • Create a fund to purchase critical spare parts which is managed by an NGO or external agency. • Provide direct technical assistance by means of a specialized professional.
Feasibility	High. There is interest in all MPAs to generate processes which improve their management. The solutions do not require large investments but need a decision from the Directors of the MPAs to implement the recommendations.
Estimated Cost	1) US$120,000 for improved administration. 2) US$40,000 for personnel training. 3) US$60,000 to create a computer program to manage field records. 4) US$200,000 to create a fund for spare parts. Would cover needs for two years. 5) US$100,000 to hire a naval engine specialist in each MPA.

Surveillance and Detection (cont.)	
Critical Aspect	Park Warden level of competence is very low, training is sporadic or non-existent • Regulatory Framework. • MPA Management. • Administrative support activities. • Survival and damage/fire control. • Operation planning. • Operation execution. Coastguards with gaps in knowledge of marine environmental management and management of marine resources.
Recommendation	1) Prepare a syllabus of basic management aspects which can serve as regional training. 2) Prepare complementary syllabus for more specialized activities (field operations, research, interception, monitoring). 3) Propose a basic training syllabus for Park Wardens on marine environmental issues. 4) Create a Regional Park Warden School which should bring together the academic sector with conservation, marine and environmental authorities. This does not have to be a physical space because available infrastructure at Universities or National Parks should be used, and regular courses for Park Wardens throughout the region should be held, to ensure a critical mass of attendance.
Feasibility	High. There is great interest in this possibility.
Estimated Cost	1) US$50,000 to design the basic and advanced syllabus and achieve an agreement with a regional university. 2) US$120,000 for "in country" courses. 3) US$120,000 + counterpart for a regional course.
Critical Aspect	Introduction of invasive species to the endemic habitats of these areas. Lack of rules and procedures relating to biosecurity or quarantines upon ship arrival.
Recommendation	Quarantine procedures and inspection/fumigation mechanisms should be implemented along with hull cleaning and interior cleaning before arrival. Requires minor regulatory modifications.
Feasibility	High. Does not require a large capital investment – mainly procedures. Benefit is immediate.
Estimated Cost	US $250,000.

Surveillance and Detection (cont.)	
Critical Aspect	Limited detection capacity (especially for smaller vessels). Smaller vessels are the hardest to detect and the most commonly used for a variety of offences. Growing tourism activity both on a local and a multinational scale. MPAs do not have the infrastructure to cope with this growth rate.
Recommendation	1) Implement electronic surveillance: • Radar. • Monitoring devices (VMS or AIS). 2) Permit the Environmental Authority to share the use of these resources for other applications such as the control of areas and monitoring harvesting activities.
Feasibility	High. The investment costs are absolutely reasonable in comparison to the value of the resources to be protected. Requires prior training of MPA personnel.
Estimated Cost	US$1,500,000 for all MPAs.
Critical Aspect	Lack of basic surveillance and detection equipment: • Binoculars. • Speed boats (better motors). • GPS. • Photo and video cameras. • Radios. • Night vision equipment.
Recommendation	Generate a list of requirements for each MPA. Facilitate a donation or support from friendly governments, multilaterals or NGOs.
Feasibility	High. All the MPAs would be interested in receiving this support.
Estimated Cost	US $125,000
Critical Aspect	No record, census or register of stakeholders, especially artisanal fishers.
Recommendation	Create a register system for violations to improve future MPA management.
Feasibility	High. All the MPAs require this instrument and do not have it yet.
Estimated Cost	US $200,000 to create database.

Interception and Arrest	
Critical Aspect	Lack of training in boarding procedures and crime scene investigation.
Recommendation	Annual regional workshop to train and standardize protocols among the four countries.
Feasibility	High. All the MPAs are interested in receiving this support.
Estimated Cost	US$180,000 for three years.

Critical Aspect	There is abundant local legislation on marine environmental issues and protection of MPAs, but it is confusing, overlapping, constantly transgressed and manipulated so as to avoid compliance, or does not correspond to the true problems and risks.
Recommendation	1) Implement regional regulations such as UNCLOS (applicable to Territorial Sea and EEZ for signatory countries) and Particularly Sensitive Sea Areas. 2) Review current legislation and adapt jurisdictions of institutions or resolve gaps. 3) Establish joint intervention agreements where more than one institution acts. These agreements must be on an operational level. 4) Encourage states to declare their most important MPAs as World Heritage Sites or Particularly Sensitive Sea Areas. 5) Create a regional marine conservation management body to act as a counterpart to fishing guilds or multinational tour operators. 6) Give autonomous jurisdiction to MPAs so that they can act as first instance judges, or delegate a nearby authority which is closer to the operational level.
Feasibility	Low. Requires political will, lobbying and eventually changes in Parliamentary Law. However, the operational relationships between the following institutions should be strengthened: • Envinronmental Authority. • Maritime Authority. • Environmental Police. This would achieve a decisive momentum. These relations must be strengthened by means of detailed cooperation agreements..
Estimated Cost	1) US$240,000 for two years work in the four countries.

Critical Aspect	Permanent pressure on MPA and EEZ resources by industrial fishers.
Recommendation	1) Enforcement goes further than the limits of the MPA, because of the freedom of which trans-national fishing vessels and tourism yachts can freely cross unguarded marine boundaries between countries. As the violations are initiated outside the MPAs, emphasis must be placed on law enforcement in the EEZs and MPAs in defense of the rights of the coastal nations. 2) Creation of buffer zones around MPAs. 3) Integrate electronic monitoring systems between the countries. Start with a regional workshop and continue with bilateral and multilateral agreements between Authorities.
Feasibility	1) Medium. Proposal must be lobbied in each country using the stakeholders in favor such as maritime authorities, coastguard, police, environmental authorities and affected communities. 2) Medium. The legal base needs to be worked on and then coordination with other State institutions. 3) High. The IMO is making this mandatory (see the LRIT regulations).
Estimated Cost	1) US$80,000 for two years. 2) US$60,000. 3) US$60,000.

Sanctions	
Critical Aspect	Weak capacity for sanctions and compliance with judicial processes in all of the countries.
Recommendation	Strengthen the position of the local environmental authority as the first instance judge for administrative cases. Impose non-economic sanctions such as: • Detention of the vessel for limited periods. • Restrict permits to leave port. • Confiscate fishing gear. • Temporary suspension of permits. • Revoke licenses.
Feasibility	Medium. Need to work on the political will of each country to get the administrative changes approved.
Estimated Cost	US$80,000. This should take a maximum of two years to achieve.
Critical Aspect	High level of cases lost and impunity.
Recommendation	1) Provide technical assistance to environmental authorities through legal aid and private external plaintiffs. 2) Annual training workshops for MPA lawyers and attorneys. 3) Public campaigns and media attention to denounce acts of impunity.
Feasibility	1) Medium. Proposal must be lobbied and support from authorities confirmed. 2) High. There is the will to do this in terms of training and Access to the District Attorney. 3) Medium.
Estimated Cost	1) US$160,000 for one year in all the countries. 2) US$240,000 to fund two years of training in all four countries. 3) US$200,000.

Sanctions (cont.)	
Critical Aspect	Impunity due to excessive time taken or pressures of other kinds.
Recommendation	1) Promote the application of administrative sanctions and minimize the intervention of judicial powers. 2) Assign more lawyers on behalf of NGOs or support agencies to monitor cases of marine violations and offences. 3) Organize private accusations in prominent cases using external attorneys.
Feasibility	1) Medium. Proposal must be lobbied and support from authorities obtained to generated the required changes in regulations. 2) High. There is interest in all MPAs. 3) Medium. Implies the risk of rejecting the position of the State.
Estimated Cost	1) US$160,000 for all the countries. 2) US$160,000 for all the countries. 3) US$120,000 for all the countries.

We hope that the information presented in this publication will lead to the adoption of strategic actions that can be implemented on both a regional and national level to mitigate the problems identified. The tables above outline the course of action that the four governments, and the NGOs which work in the Seascape, might take to address the most pressing problems. The specific actions we recommend are expected to improve law enforcement in the Seascape and thus improve the protection of its natural coastal and marine resources for generations to come.

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